Salmonella Dublin

Who, What, When, Where and Why

Belinda S Thompson DVM
Veterinary Support Services
Animal Health Diagnostic Center
College of Veterinary Medicine
Cornell University
bt42@cornell.edu
pdv3@cornell.edu

Salmonella Dublin -Why you should care!

- Insidious Disease
  - ❑ **Silent Carrier animals as well as a range of sickness**
- Resistant to multiple antibiotics
- Kills calves; makes calves sick; very frustrating for calf caretakers
- Zoonotic – infectious to people via bodily excretions of infected cattle, or consuming contaminated foods/raw milk

Salmonella Dublin-Who?

Current strain was recognized in NYS in 2006.

Confirmed detection in 3 herds

Multiple alerts to veterinarians and dairy producers followed

Salmonella Dublin – Who?

- NYS 2012 Bulk Tank Prevalence Study
  - ❑ 5152 avg. # NYS dairies shipping milk 2012
  - ❑ 5245 total samples collected
  - ❑ Duplicates and multiple tanks for individual farms identified by code
  - ❑ All testing performed coded and anonymously
  - ❑ 4896 herds tested (~256 missed)
  - ❑ 44 positive herds detected (0.90%) with antibodies in milk indicating exposure in herd

Salmonella Dublin – Who?

National Animal Health Monitoring System Dairy 2014

- NEUSAHA meeting passed a resolution asking to have Salmonella Dublin prevalence studied in the Dairy 2014 NAHMS study
- USDA added the collection of bulk tank milk samples for Salmonella Dublin ELISA testing to the Dairy 2014 study.
- Prionics (now Life Technologies) provided the Salmonella Dublin ELISA kits at no cost.

Salmonella Dublin – Who?

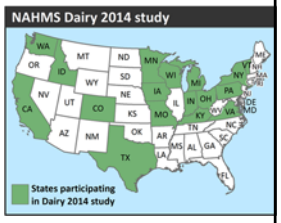
NAHMS Dairy 2014 Results

- Salmonella Dublin antibody test on bulk tank sample
- 8.0 % of dairy operations had Salmonella Dublin antibodies in a single bulk tank sample
- 500 or more cows: 39.2%
- 100-499 cows: 2.1%
- 30-99 cows: 1.0%

Salmonella Dublin – Who?

NAHMS Dairy 2014 Results

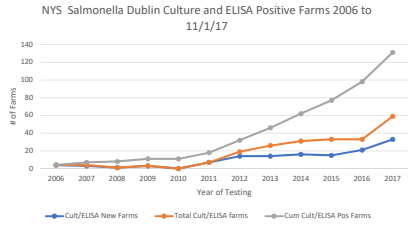
- Salmonella Dublin antibody test on bulk tank sample
- West (CA, CO, ID, TX, WA): 52.1% antibody positive
- Midwest (IA, IN, MI, MN, MO, OH, WI): 4.4%
- East (NY, PA, VT): 0.6%
- P<0.0001



The bad news is that a single bulk tank test was only about 35% sensitive in detecting infection within a herd. (Denmark)

Salmonella Dublin-Who?

Here we are in NYS in 2017, as of November 1.



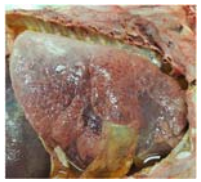
Data from Animal Health Diagnostic Center at College of Veterinary Medicine, Cornell University 2006-2017 Aerobic cultures, Salmonella Dublin ELISA tests

Salmonella Dublin-What?

- Salmonellosis in cattle is not all one thing
- *Salmonella* Dublin is different form the typical Salmonella infection that most producers and veterinarians have experienced in cattle, other species, and even humans

Salmonella Dublin-What?

- Typically looks like sudden onset pneumonia in calves as its most common presentation
- Calves from 1 week to 8 months
- High death rate
- Sometimes just high fever and death
- Sometimes accompanied by seizures
- May develop diarrhea, typically prior to death.



Picture courtesy of Dr. Julia Rodriguez-Ramos Fernandez

Salmonella Dublin-What?

- Can see individual sick calves in individually housed calves (hutches, separated wire pens)
- Typically see outbreaks in first group housed pens
- Used to be outbreaks almost exclusively of weaned calves
- Now seen in group-housed calves on milk,too

Salmonella Dublin-What?

- Some calves get infected without getting sick
- Some calves just get a fever and recover with or without treatment
- Some calves get very, very sick but appear to respond to antibiotic treatment
- Many calves die despite aggressive antibiotic and other treatment

Salmonella Dublin-What?

- Older animals typically don't show illness
- If they do, abortion of pregnant animals is one important presentation
- Sick cattle that look like they have coliform mastitis but you don't find any mastitis
- But QMPS positive milk cultures of clinical mastitis samples
- Rarely associated with diarrhea in adult cow; might be incidental finding in carrier animal?

Salmonella Dublin-What?

Any animal that gets infected might become a carrier animal but only a small percentage do.

More likely to become a carrier:

- the younger they are when infected
- If treated with anitibiotics

Salmonella Dublin-What?

http://www.saskatooncolostrum.com

- Older, carrier animals typically don't show illness but they can spread the disease
- Transmission to calf in uterus –either abortion or birth of infected calf
- Transmission to calf after birth – infected body fluid, feces, colostrum
- Transmission from maternity pen environment

Salmonella Dublin – When?

- Infrequently detected disease in NYS prior to 1988
- 1988-1995 *Salmonella* Dublin isolated from samples from 13 farms in NYS
- No reports from NY, PA or OH prior to 1988
- Not diagnosed between 1996 and 2006 in NYS
- Exists all over the world in cattle populations

McDonough et al *J Clin Micro* 1999;37(8):2418-2427 & NAHMS 2014 data

Salmonella Dublin – Where?

- Solidly entrenched in NYS herds
- Can introduce to an uninfected farm with:
  - Purchased adults or young stock
  - Heifers returning from off-site heifer raisers if comingled with other herds' heifers
  - Show animals coming home
  - Embryo recipient dams
  - Offspring of embryo recipient dams – either born offsite or born at home
  - Manure, milk or colostrum from another farm

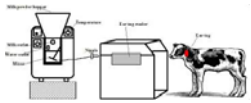
Salmonella Dublin – Where?

In the infected, sick animal:
Tonsils
Blood stream
Major organs (lungs, liver, kidneys, spleen, maybe brain)
Lymph nodes
Bodily fluids – saliva, birth fluids, milk, vaginal discharge
Sometimes in intestine and/or feces

In the infected, healthy silent carrier animal:
Lymph nodes
Intermittently (unpredicatable) in bodily fluids and feces

Salmonella Dublin – Where?

In the environment on the farm:
Feeding utensils
Shared nipples
Waste milk (unpasteurized)
Colostrum
Manure contaminated feeds
Shared waterers
Contaminated Bedding
Anything in contact with infected body fluids



https://www.biotic.com/calves.html

Salmonella Dublin – Where?

***Salmonella* Dublin bacteria in diagnostic samples**:
Whole dead calves for necropsy
Major organ tissues submitted for bacteria detection tests (culture/PCR)
Special blood culture bottle with blood from sick calves
Mastitis milk samples for culture
Feces is a poor diagnostic sample for *Salmonella* Dublin
Environmental, feed, water samples – we are working toward better tests for this

Salmonella Dublin – Where?

Antibodies against *Salmonella* Dublin in diagnostic samples:

Blood samples from previously infected or carrier animals

Milk samples from previously infected or carrier animals

Bulk tank or string samples including milk from previously infected or carrier animals

Salmonella Dublin - Why

Immune strength of calf and infectious dose probably determine which calves get sick and die, which get sick and get better, and which get infected without showing illness

Many calves die despite aggressive antibiotic and other treatment.

Salmonella Dublin - Why

- **MULTIDRUG ANTIBIOTIC RESISTANT**
- Sensitive to only 3/20 antibiotics (enrofloxacin, gentamycin and trimethoprim/sulphamethoxazole

Salmonella Dublin - Why

- Even with antibiotics, bacteria can overwhelm the patient when they have already spread to all tissues. This is also true in human sepsis cases
- Treated animals that survive may be/often are permanently stunted and/or unproductive

Salmonella Dublin - Why

Other issues with antibiotic treatment

- **Treatment with antibiotics may help turn individual animals into carrier animals**
- **Treatment with antibiotics will eventually contribute to development of more antibiotic resistance – Evolution at work**
- **It is better to prevent this than to try to treat it!**
- **Exquisite management is the best tool for control**

Salmonella Dublin - Why

- **Since *S.* Dublin can infect people, need to preserve susceptibility to medically important antibiotics in case it is you or me who gets sick.**
- **It is illegal to use Baytril or other Enrofloxacin brands of antibiotics to treat Salmonella Dublin**
- **Antibiotic resistance can transmit from one *Salmonella* to other, unrelated *Salmonella* bacteria.**
- **This might have already happened resulting in multidrug, enroflaxacin-resistant *Salmonella* Heidelberg strain making people sick in the US now.**

Salmonella Dublin -Why you should care!

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Salmonella Dublin

- **Who – Real risk to all farms**
- **What – Treacherous and crafty bacterial disease that has animal welfare, economic and public health concerns**
- **When – Consistent and growing issue in NYS since 2006**
- **Where – In infected animals, in contaminated environments and feedstuffs**
- **Why – Invasive, antibiotic resistant infection that rapidly causes sepsis.**
- **Easier to prevent than to treat**

Questions?