Salmonella Dublin – Risk factors and control measures

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Salmonella Dublin – risk factors and control

- Already discussed Who, What, When, Where, and Why
- None of you want to see this in calves
- Some of you know you have seen this in your herds
- What can be done about it?

Salmonella Dublin Control

- What is your incentive for doing something about it?
- Animal welfare
- Economic loss – sick, dead, abortions, vet bills, drug bills, lost production, lost sales
- Lawsuits?
- What is the economic cost in a herd? If calf mortality goes from 3% to 17.8%? Or 28%?

Salmonella Dublin Control

Another incentive: identification and reduction of risks will have an impact on all diseases transmitted by the same routes – Johne’s disease, other Salmonellas, calf diarrhea pathogens, parasites, other zoonotic infections for people like E.coli, Leptospirosis, and Cryptosporidium
Salmonella Dublin risks and Control

Plan for this discussion:
• Transmission routes to cattle
• Transmission routes to people
• Performing a formal risk evaluation
• Writing a plan to keep it out of a herd
• Writing a plan to control it in a herd
• Best management practice examples

Where to use testing?

Salmonella Dublin - Transmission to cattle

• Oral route of infection
  - Feces
  - Nasal secretion
  - Saliva
  - Other bodily fluids (milk, vaginal fluids, birth fluids)
  - Feed or Water Contaminated by above
• In Utero – crosses placenta
• Other – might transmit on contaminated medical devices (needles, etc)

Salmonella Dublin - Transmission to people

• Oral route of infection
  - Feces
  - Nasal secretion
  - Saliva
  - Other bodily fluids (milk, vaginal fluids, birth fluids)
  - Contaminated food, drinks, fomites
• Other – might transmit on contaminated medical devices (needles, OB sleeves, etc)
• Contact with broken skin (birth fluids, aborted fetuses especially)

Salmonella Dublin - Transmission

1. Identifying transmission risks once the routes of transmission are known
2. Identify all places on the farm that the things mentioned in the previous 2 slides can happen!
3. Don’t forget any!
Perform a formal risk evaluation.

It should be written.

Available tool:
https://ahdc.vet.cornell.edu/programs/NYSCHAP/docs/NYS_modified_Risk_scores_Salmonella_Dublin.xls

- Calving/Maternity area
- Calves on milk
- Weaning to ~6 months
- ~6 months to Pre-fresh heifers
- Cows
- Opportunity to import S Dublin from other farms
- Public Health concerns
**Salmonella Dublin Transmission**

- **Maternity pen – risk for transmission to calf**
  - Exposure to cows other than dam
  - Exposure to adult cow manure
  - Suckling manure-contaminated teat
  - Sick cows in maternity area
  - Time in maternity pen
  - Udder hygiene

- **Colostrum feeding**
  - Fed manure-contaminated colostrum
  - Raw vs heat treated or acidified colostrum
  - Pooled raw colostrum vs raw colostrum from a single dam
  - Fed with saliva-contaminated utensils or esophageal feeder

- **Calves on Milk**
  - Contaminated raw milk
  - Nose to nose contact between calves
  - Bedding, stall, pen hygiene between animals/groups of animals
  - Shared nipples or waterers
  - Shared feed utensils
  - Shared medical treatment equipment
  - Contact with adult cow manure
  - Ventilation issues
  - Ability to isolate sick calves

- **Weaned calves**
  - Nose to nose contact
  - Contaminated water and feed
  - Contact with manure from other age groups
  - Separation/isolation of sick calves
  - Ventilation issues
  - Shared equipment
  - Stocking density
Salmonella Dublin Transmission

- Older heifers
  - Contact with sick animals
  - Contact with manure from other age groups
  - Contaminated feed or water
  - Ventilation issues
  - Contact with abortion uterine fluids/aborted fetuses

Salmonella Dublin High Risk Management Practices

- Wet calves sharing nipples, feeders
- Raw milk feeding in infected herd
- Manure flush systems, crossing age groups
- Comingling animals from different herds with unknown status
- Unknown – Acidified raw milk

Salmonella Dublin Testing

- Investigate causes of illness and death
- Especially calves with high fevers, pneumonia that does not respond well to antibiotic treatment
- Increased abortion numbers
- Veterinary diagnostics: post mortem exams, cultures/PCRs, antibiotic sensitivity tests, blood tests, microscopic examination of tissues.
**Salmonella Dublin Testing**

- If current *S. Dublin* herd status is **unknown**:
  - Consider testing bulk tank milk samples using the *S. Dublin* ELISA to classify the herd
  - Ideally need 4 samples over 5-12 months period to more accurately classify herd
  - A positive test result is pretty convincing
  - Depending on how fast or sure of a negative herd status you need to be, consider testing all young stock.

**Salmonella Dublin Written Plans**

- If herd is currently **low risk or test negative** for *S. Dublin*:
  - Institute strict written biosecurity protocols to keep *Salmonella* out
  - Incorporate into written herd health plan
  - If farm is purchasing animals
    - Isolate animals on arrival
    - Test herd of origin at the herd level
    - If herd of origin is unknown then consider testing individual animals at time of purchase with ELISA and repeat in 7 weeks

**Salmonella Dublin Written Plans**

- If herd is **known** to be **infected** with *S. Dublin*
  - Use the risk evaluation form
  - Prepare a written plan to control as many of the risks identified, starting from most serious (highest scores)
  - Assign tasks to specific individuals
  - Review the plan regularly
  - The NYS Cattle Health Assurance Program provides an excellent, proven way to do this!

**Salmonella Dublin Written Plans**

- If herd is **known** to be **infected** with *S. Dublin*
  - The single most important aspect of control is to close the infection routes that expose newborn and young calves
  - *S. Dublin* can be aerosolized and high pressure washing is not recommended both from the risk to other calves but also the human health risk
**Salmonella Dublin Written Plans**

- Factors associated with successful control of S. Dublin in the calf barn of Danish herds:
  - Good calving management and hygiene
  - Single pen housing with solid walls rather than bars
  - Preventing cows from calving before being moved into the designated calving pen (Just in time movement!)
  - Good consistent colostrum feeding practices

Nielsen et al., 2012

**Salmonella Dublin Written Plans**

- Factors associated with successful control of S. Dublin:
  - Heat treatment/pasteurization of milk/colostrum or milk replacer use
  - Mange stocking density to allow for separation between age groups and isolation of sick animals
  - **Don’t introduce infected animals into herd**

**Salmonella Dublin Written Plans**

Is Vaccination helpful?
- Maybe yes, maybe no.
- Should treatment be included in the written plan?
- Yes, with the assistance of your veterinarian, and the understanding that it may be ineffective in preventing illness, deaths, production losses.

**Salmonella Dublin Written Plans**

- Should a test and cull strategy be used with S. Dublin?
  - Typically, no.
  - Multiple tests are needed to define cattle with persistently elevated titers (2-3 samples over 4-8 month period of time)
  - Still does not prove shedding status (active versus latent)
  - Testing and culling without improved management is likely not going to be frequent enough to avoid new infections and new carriers.
Salmonella Dublin Written Plans

• If herd is known to be infected with S. Dublin
  • S. Dublin ELISA (blood test) can be used as a management tool in groups of calves greater than 3 months of age to monitor exposure rates during neonatal period

Salmonella Dublin Written Plans

• How long will it take to see effects of management changes?
  • One study showed it took 3 years from initiation of control actions until monitoring suggested that S. Dublin was no longer spreading and the antibody blood tests were low in all age groups of the herd

Nielsen and Nielsen, 2012
**Salmonella Dublin Public Health Measures**

- Prevention for animal caretakers and visitors
  - Most susceptible: very young, elderly, and immunosuppressed. Keep them away
  - Wash hands well, using soap and water and scrubbing for 15 seconds, before returning to the household.
  - Wash hands well, using soap and water and scrubbing for 15 seconds, before eating, smoking or activities touching face.
  - Outer garments and footwear exposed to infected animals and their discharges should not be brought into the household.
  - Manure, nasal secretions, saliva, blood, milk and uterine discharges should all be considered as infectious.
  - Do not drink raw milk!
  - If somebody from a farm with S. Dublin is very sick with a fever, with or without vomiting and diarrhea, they should tell the doctor about the multidrug resistant S Dublin on the farm.

**References**

- Nielsen, LR, van den Borne, B, and van Schaik, G. *Salmonella* Dublin infection in young dairy calves: Transmission parameters estimated from field data and an SIR-model. Preventive Veterinary Medicine. 2007; 79:46-58
- Nielsen, LR. Overview of the pathogenesis, epidemiology and diagnostic tools necessary for successful surveillance and eradication of *Salmonella* Dublin from the Danish cattle population. Prize assignment “Professor Dr.med.h.c. C.O. Jensens Mindefond”. Department of Large Animal Sciences, University of Copenhagen. 2009. 70 p