Salmonella Dublin in Dairy Cattle

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provided by Hoard's Dairyman

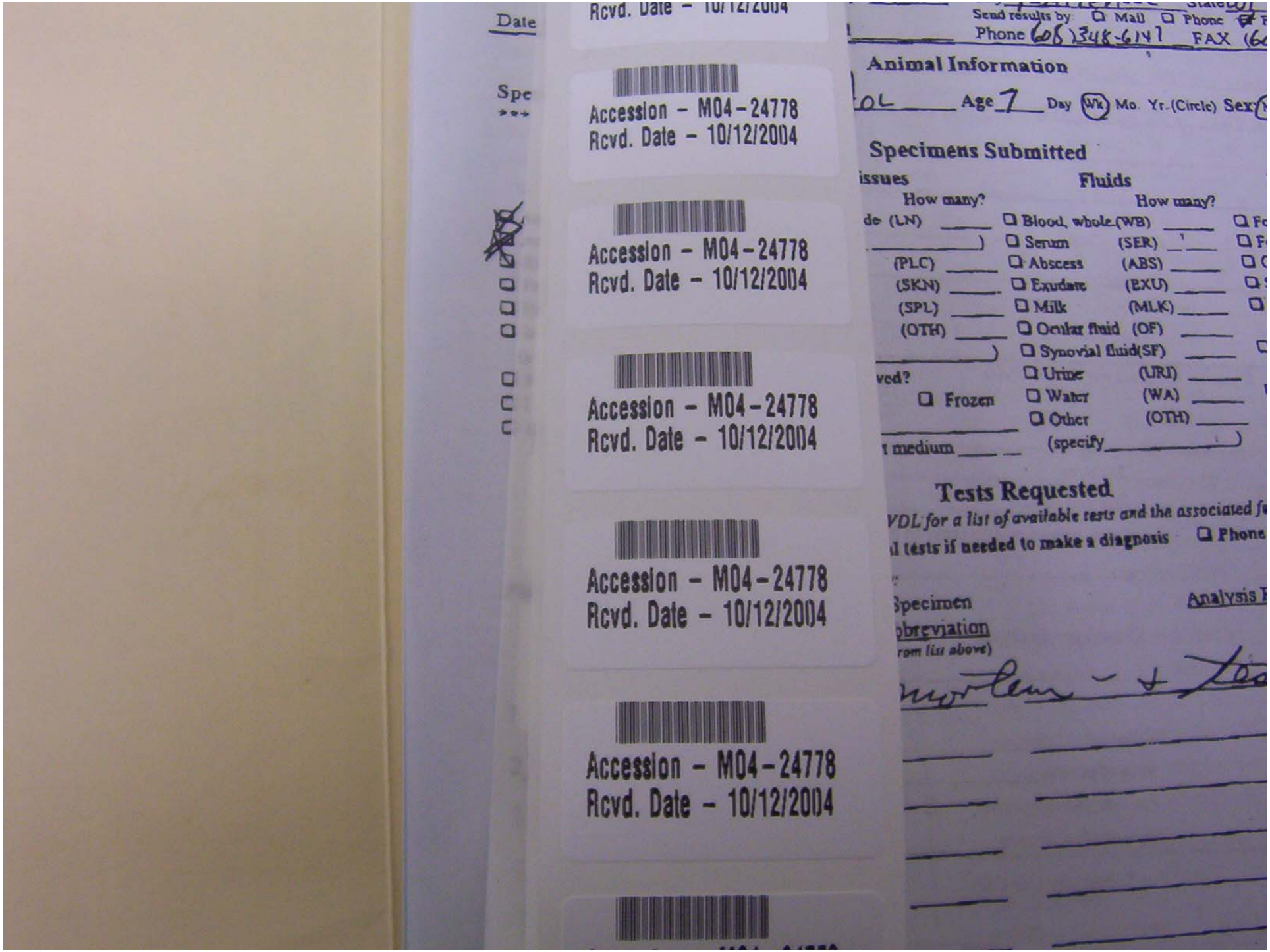
Salmonella Dublin

- Cattle are host-adapted species (carriers)
- Humans: *Salmonella* typhi
- Found in every major dairy producing state in the U.S.
- Two syndromes: enteritis in calves less than 4 weeks of age and pneumonia in calves 6-8 weeks of age and older. Other clinical presentations as well

Salmonella Dublin

- Control starts with close-up cows and calving pen management
- Colostrum delivery (timing, quantity and timing)

  Brix ≥ 22
- Nutrition (1.0 kg/hd/day dry matter) hygiene and sanitation, consistent diet, microbiome support and minimizing stress particularly at weaning time.
- Proper cleaning and disinfection
- Water quality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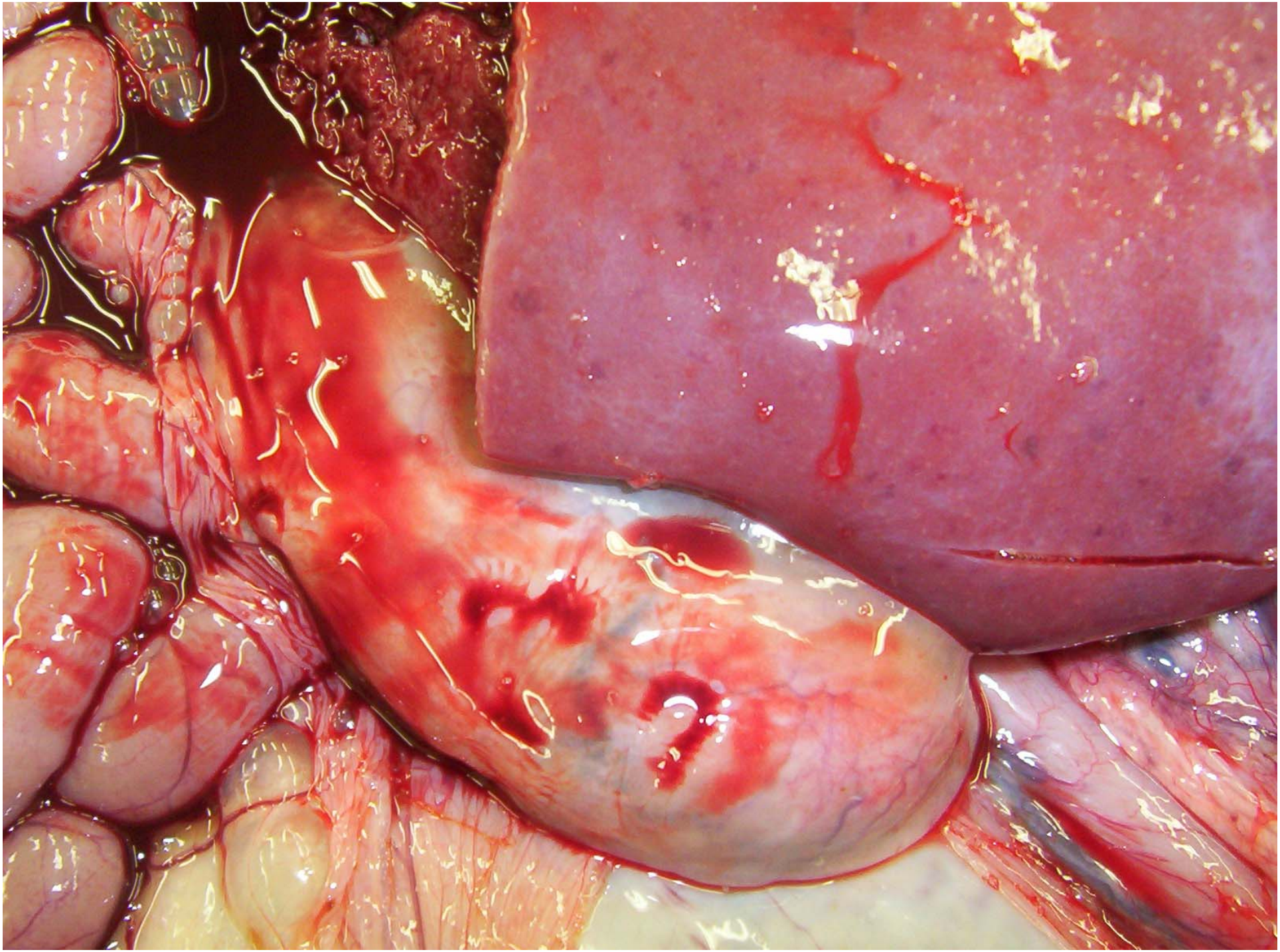
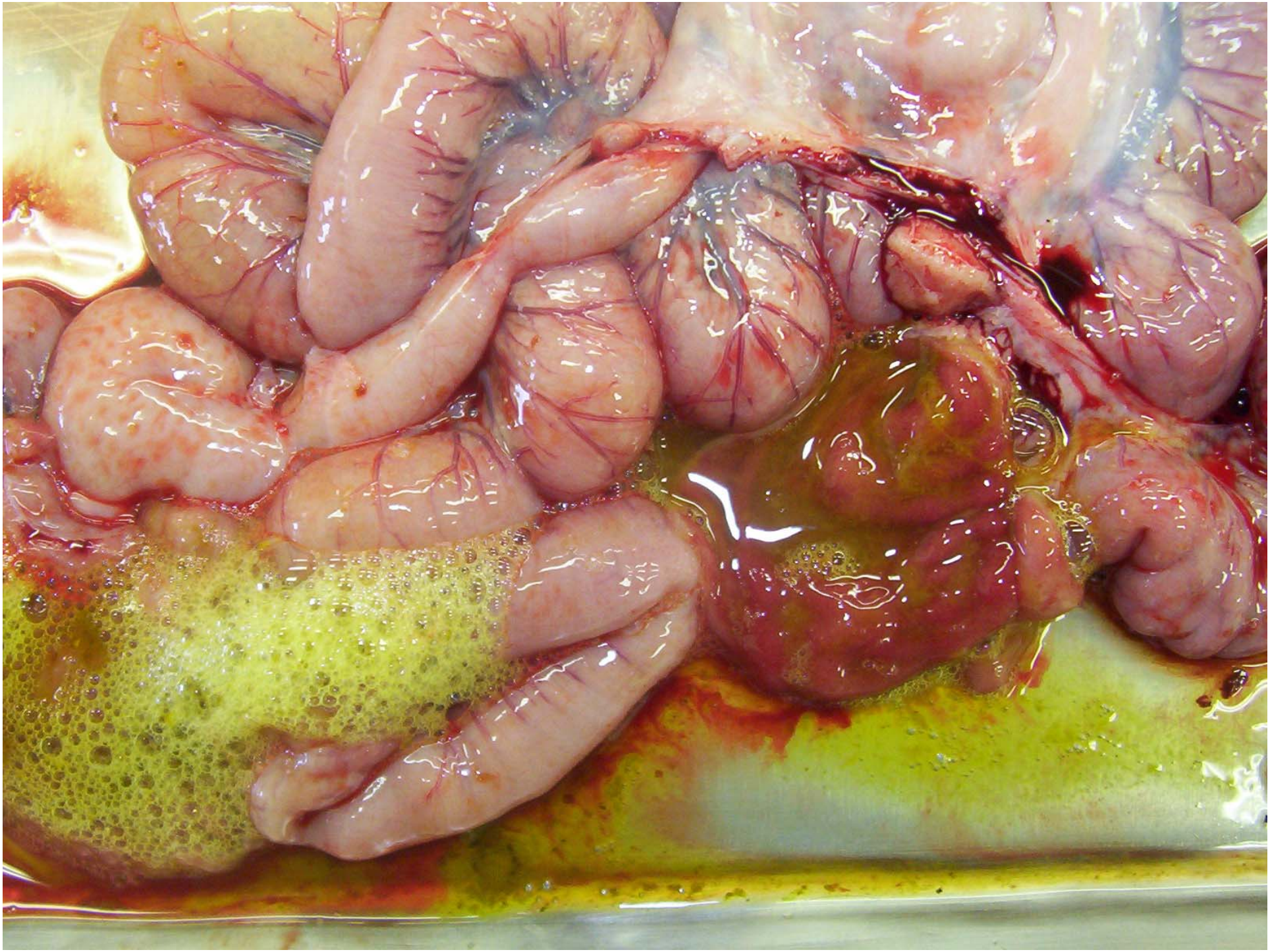
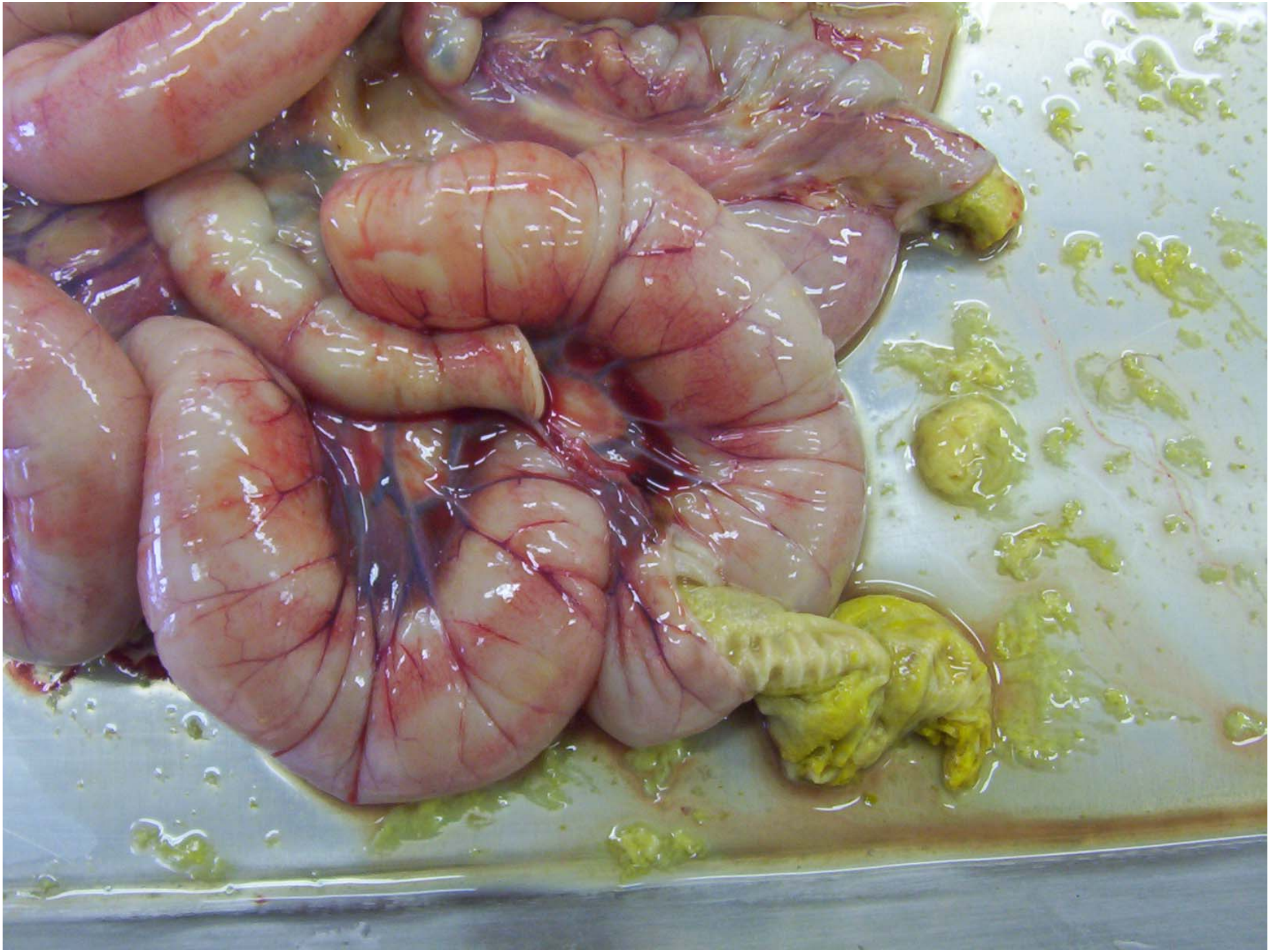
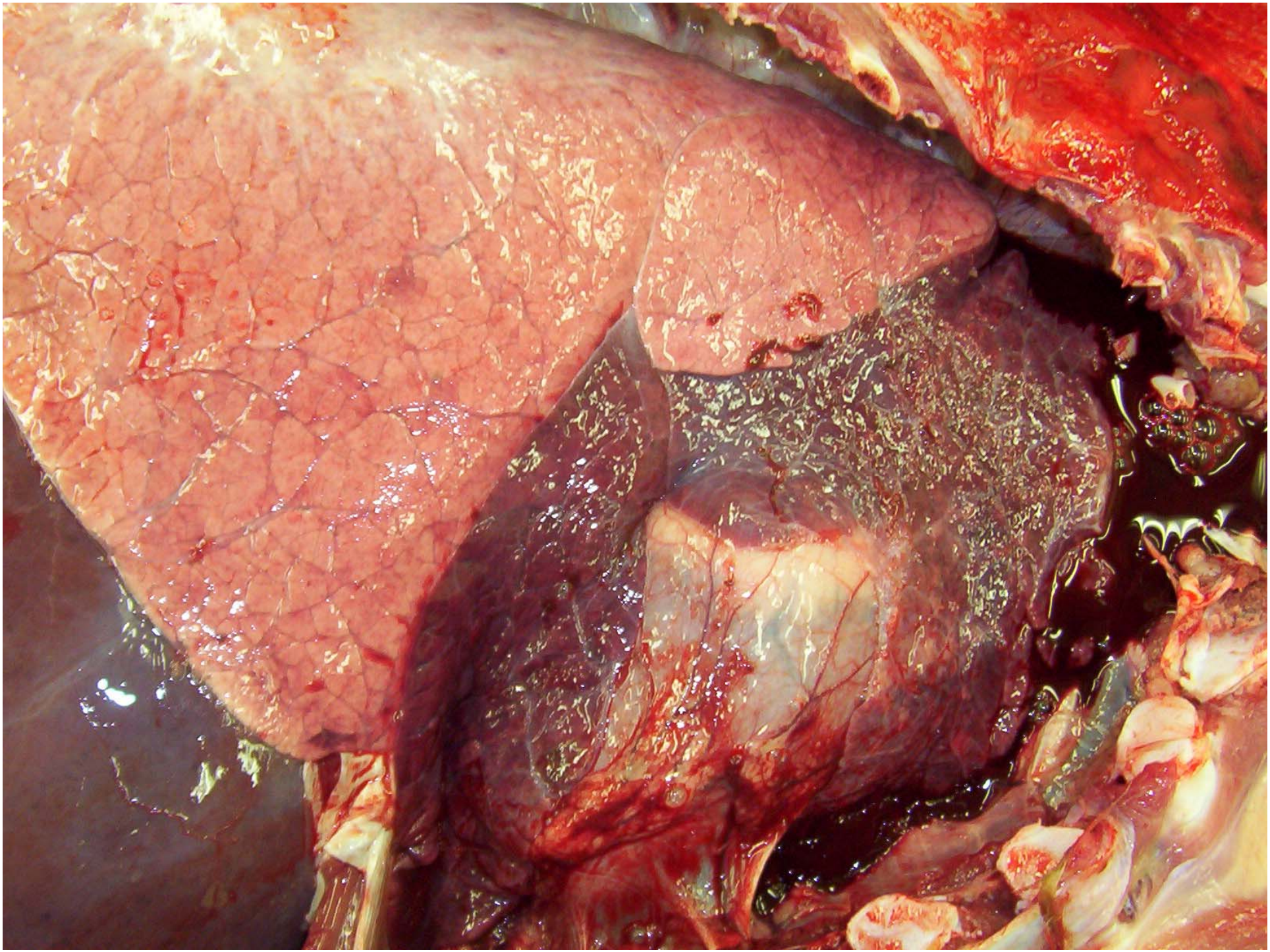
Rcvd. Date - 10/12/2004
Send results by Mail Phone
Phone 608 348-6147 FAX
Animal Information
Age 7 Day Wk Mo. Yr. (Circle) Sex
Specimens Submitted
Tissues
How many?
Fluids
How many?
Blood, whole (WB)
Serum (SER)
Abscess (ABS)
Exudate (EXU)
Milk (MLK)
Ocular fluid (OF)
Synovial fluid (SF)
Urine (URI)
Water (WA)
Other (OTH)
(specify
Frozen
Tests Requested
Specimen
Abbreviation
Analysis









Laboratory Diagnosis

- Isolation of organism from tissues/feces
- Inoculate selective enrichment media (XLT4 and Brilliant Green with Novobiocin) and enrichment broths Selenite-S Tetrathionate, Rappaport-Vassiliadis
- After 18-24 hours if no growth is observed new plates are inoculated with samples from enrichment broths.
- Suspect Salmonella colonies. Identity confirmed by MALD-TOF (matrix-assisted laser desorption/ionization time of flight)
- Salmonella bacteria are serotyped using commercially available anti-sera using the Kauffman-White classification scheme.

Laboratory Diagnosis

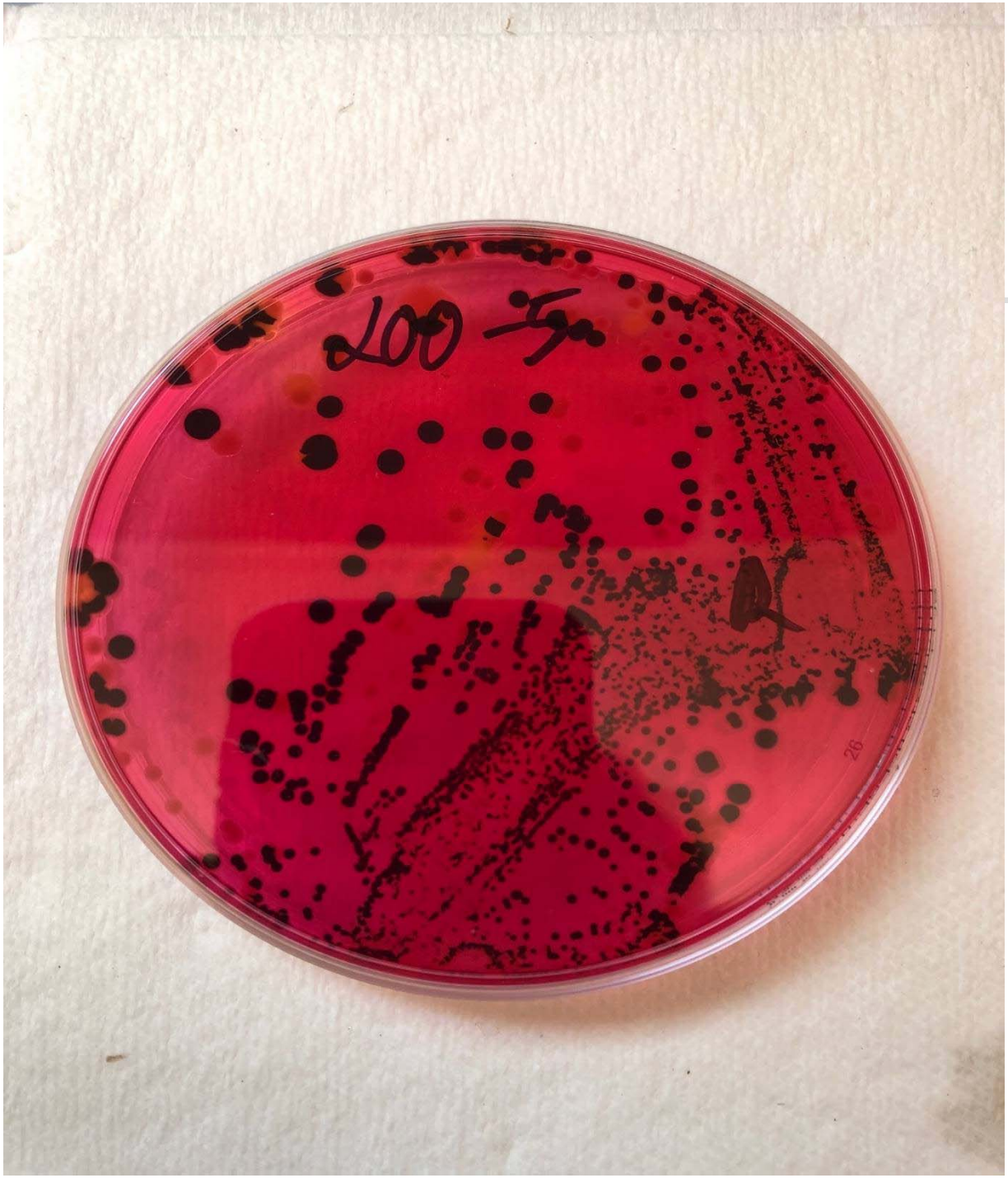
- *S.* Dublin difficult to isolate by culture in fecal and environmental samples
- Easy to culture from tissues of diseased animals
- Work with a diagnostic lab that has a lot of experience with dairy cattle diagnostics and culturing *S.* Dublin
- Tremendous variability in U.S. diagnostic labs in the ability to isolate *Salmonella* Dublin from diagnostic samples
- Low to moderate numbers will only be recovered in Selenite-S enrichment broth and XLT4 agar
- Will not grow very well in tetrathionate, Rappaport-Vassiliadis broth and NEVER grows in brilliant green agar

WVDL Protocol for *Salmonella* Dublin

- Fecal and/or tissue samples are added to BPW (buffered peptone water)
- Incubated 16-24 hours at 35 °C
- Run Salmonella spp. PCR test. All positives with a Ct value of 35 are cultured
- Add BPW to 3 different enrichment broths
- Incubated at 35 °C for 24 hours

WVDL Protocol for *Salmonella* Dublin

- Inoculate selective agar plates (brilliant green and XLT4) and incubate for 24 hours
- Suspect colonies for Salmonella identity confirmed with MALDI-TOF
- Confirmed Salmonella isolates are serotyped
- Antimicrobial susceptibility test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Salmonella Dublin Serology

- Commercially available ELISA test available from Europe
- Can test milk (individual cows or bulk tank) or serum samples
- Cost effective and fast ($9.00/sample)
- Best available diagnostic test for clinically normal animals and estimating herd prevalence of *S.* Dublin

Salmonella Dublin Serology

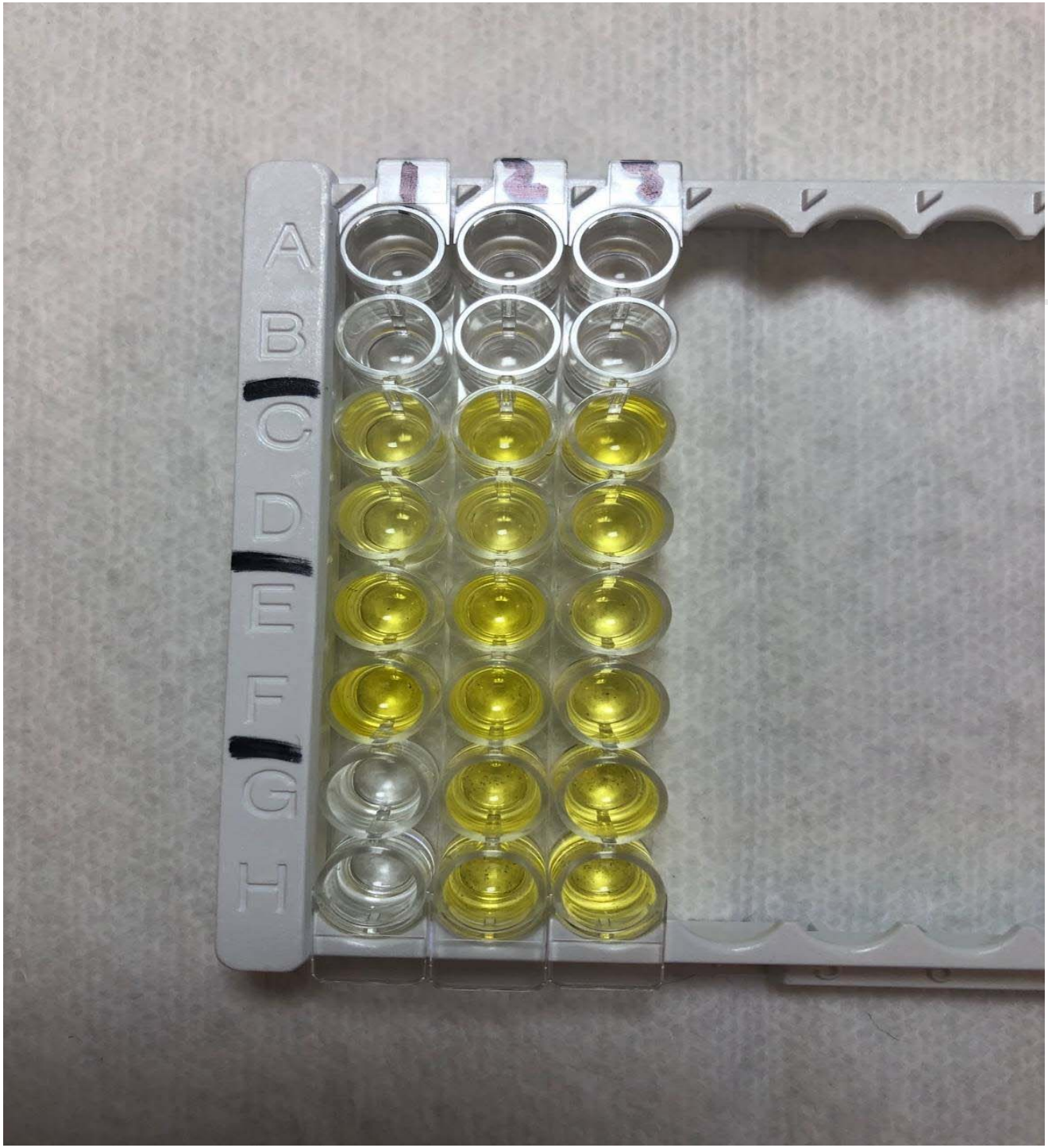
- Test individual animals that are 100 days of age or older
- Best for animals that are 5-10 months of age
- Sensitivity and specificity 72% and 98%, respectively in calves
- Sensitivity and specificity 52% and 95%, respectively in cows

Salmonella Dublin Serology

- Bulk tank milk specificity estimated to be 99%. Useful to determine if herd probably infected or free of S. Dublin
- Carrier animal defined as having 3 consecutive positive ELISA tests with an interval not less than 8 months between the first and 3rd test
- Very useful tool to determine if S. Dublin present in a group of animals
- 35% positivity or higher is classified as a positive test. Percent positivity is the Optical Density (ID) of the test sample relative to the OD of the positive control

Salmonella Dublin Serology

- Higher % positivity the higher the probability it is a true positive result and the animal is a carrier for *S.* Dublin
- True positive highly likely if % positivity is 50% or higher, possible exposed animal if % positivity is between 35-49%
- Probable carrier if % positivity is 80% or higher
- Cannot use serology in *S.* Dublin vaccinated animals unless given by the oral or intranasal route for the EnterVene-d MLV vaccine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Bovine Salmonella Serotypes

Serotype	2017	2018	2019
Cerro (K)	230	118	135
Dublin (D1)	107	167	136
Montevideo (C1)	104	88	93
Newport (C2)	72	42	26
Typhimurium	36	48	45

Salmonella Vaccines

- Modified live Salmonella vaccines have greatest efficacy in experimental studies
- One modified live Salmonella vaccine approved for use in calves in U.S. (EnterVene-d)
- Adverse reactions when given SQ in calves less than 2 weeks of age
- Jones PW et al. 1991. Oral vaccination of calves with experimental salmonellosis using a double aro mutant of *Salmonella typhimurium*. Vaccine 9:29-34

Salmonella Vaccines

- Oral administration (full dose) roughly 4 hours after morning feeding of milk or CMR
- Vaccine put in OLS with 5% sodium bicarbonate
- 20 ml volume delivered in the back of the throat with a syringe or drink 200 ml of OLS
- Can give 2 mL dose I.N.
- Vaccinate calves:4-7 days of age and repeated 14-21 days later
- Efficacy: 40-50%

Questions

- Clinical trials demonstrating safety and efficacy of vaccine in calves
- Does vaccination reduce fecal shedding of *S.* Dublin*?*
- Does vaccination reduce the incidence of *S.* Dublin carrier animals?
- One dose or two doses of vaccine
- Can vaccine be placed in milk or CMR?
- Duration of immunity
- Cross-protection against other Salmonella serovars