The Facts and Fiction Regarding STEC O157 in Cattle

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- facts – highlights on STEC O157 epidemiology and ecology in cattle and their environment
- fiction – explain some complexities and dispel “myths” that circulate(d) about STEC control

Key facts/fiction about STEC O157

Epidemiology and ecology of fecal shedding of STEC O157 in cattle
- Variability
- Seasonality
- Production systems
- Diet
- Water
- Wildlife

STEC O157 in cattle:

STEC O157 are:

- Enteric bacteria .... shed (transmitted) in feces
- Fecal/oral transmission
- Found in/on healthy cattle and a variety of other species
- Found in a variety of cattle environments; essentially all herds

Impacts transmission, potential risks, and potential control focus (?)
Variability in STEC O157 – pens

Day of harvest – 44 feedlot pens; Overall ~ 30%

Fecal Prevalence

- Why?
- Mitigation?

Variability in STEC O157 – individuals

Most cattle shed STEC O157 at low concentrations
Some shed O157 at high concentrations; ~ >10⁴ CFU/g feces
“super shedders”
10% of cattle = 90% of fecal shedding
Associated with pen prevalence, transmission, contamination of hides, carcasses, etc.

Super-shedders – difference in animals or different phase of infection?

Intermittent shedding – variability within & between calves

Effects of diet and production system

- Public interest
- Misconceptions

Grass-fed vs. Grain-fed

Grass vs. Grain – STEC O157

- Evaluate the original literature –many Internet summaries confuse generic E. coli with STEC O157
- Numerous studies associate grain feeding with increased fecal concentration of generic and acid-resistant E. coli
- In contrast, forage-based diets have been most commonly associated with increased shedding levels or increased duration of shedding of O157

From Dr. David Smith
http://extension.wsu.edu/vetextension/ec/Pages/Factsheets.aspx
Most (>80%) ranch calves (on grass) have been exposed to *E. coli* O157 prior to weaning, and all ranch herds have *E. coli* O157.

Laegrid et al., 1999

After accounting for age, researchers have not seen a difference in STEC fecal shedding between cattle in extensive grass pastures or in confinement.

Renter et al., 2004

### Different production systems

No striking differences in STEC O157 among different production systems

Reinstein et al., 2009

### Distiller’s Grains – byproduct of ethanol production

Cereal Grains (e.g. Corn) → Ethanol → Distiller’s Grains (DG)

Distiller’s Grains – a good quality cattle feed

- Concentrated in fiber, fat and protein
- Useful to cattle as a protein or energy source
- Fed at different inclusion levels
- 10-40% ...largely affected by corn price

Distiller’s Grains (DG) – STEC O157 shedding

- Positive association
- Effects are apparent in several studies (but not all – different diets, cattle, etc?)
  - Roughly 2 fold increase
  - Dosage effects?
- Mechanisms unclear
  - Mitigation opportunities?

Jacob et al., 2010
Cattle Diet and STEC O157

- Diet associated with fecal shedding
  - Grain vs. forage
  - Feeding distiller’s grains
  - Grain type, processing method, etc.

- Mechanisms (exact) remain unknown
  - May provide opportunities for mitigation – practical solutions?

Other Species/ Sources

- Other ruminants
  - Deer, sheep, goats
- Other mammals
  - Opossum, raccoon, coyotes, cats,…
- Feral swine
  - (spinach outbreak)
- Birds
  - Starlings, turkey, flies
- Transmission to and from cattle
  - Primarily in and around cattle environments

Facts and Fiction - STEC O157 in Cattle

Epidemiology and ecology
  - Better understanding of risks and risk factors
  - Some common misconceptions
    - Variability herds/pens/calves
    - Grass vs grain
    - Confinement pens vs pasture
    - Cattle AND other species/sources

Facts and Fiction - STEC O157 in Cattle

Epidemiology and ecology, still opportunities
  - Variability among groups and individuals
  - Dietary mechanisms

Myths are counter-productive