Fact Files – ETEC Infections

What's the Deal with ETEC?

E. coli is a welcome member of normal gut flora and can be isolated from most fecal samples. However, some E. coli strains are pathogenic and cause disease. Neonatal and post-weaning diarrhea is frequently caused by ETEC (**E**ntero**t**oxigenic **E**. **c**oli) infections. ETEC infections typically result in: colonization of the intestinal mucosa and the production of enterotoxins, a flux of water and electrolytes into the intestinal lumen and watery diarrhea resulting in dehydration and electrolyte imbalance which may cause death. ETEC strains can also cause hemorrhagic gastro-enteritis and septicemia.

What does the name mean?

The nomenclature for ETEC strains (such as O149:K91:F4) provides information about the antigenic sites and classifies strains that have been shown to cause enterotoxigenic infections.
–O indicates a cell wall or somatic antigen determined by sugar-side chains on the cell membrane
–K indicates a capsular antigen (a goopy coating of polysaccharides around the cell)
–F indicates fimbrial antigens (I.e. F4 and F5), which are adhesins that allow the E. coli to stick to the intestinal cells (think grappling hooks)

How Do I know if it is Significant?

ETEC strains have been shown to cause infections resulting in neonatal diarrhea, but the isolation of ETEC strains does not definitively assure that this is the root cause of the problem. Case history, histology and viral and parasitic screening can help to resolve this issue.

When ETEC strains are isolated, looking at prevalence in each sample as well as across a number of samples (for example, was it isolated in high numbers, was it isolated from more than one animal) can be useful. It is sometimes useful to make multiple submissions as well to look for consistency over time.

Further tests including PCR analysis can be requested if the significance of an isolate is in question. Detection of toxin genes and genes for fimbrial antigens by PCR may clarify significance of an E. coli isolate that does not serotype, but appears to be predominant in sick animals.

Other bacterial pathogens to consider when submitting diagnostics for neonatal scours include Clostridium difficile and Clostridium perfringens as well as Salmonella spp. If herd history or clinical symptoms suggest that these pathogens may be involved please indicate this on the submission form when sending to our laboratory, as we will enrich for these pathogens to improve recovery. Although we do produce bacterins for C. difficile, we do not conduct primary isolations for this pathogen.

Does It Have To Be F4 Positive To Be Significant?

F4 positive isolates (such as O149:K91:F4) can certainly be the cause of scours in piglets and weaned pigs, however, F4 positive isolates are less commonly isolated in cases submitted to our laboratory for neonatal scours, likely because the F4 pilus is included as an antigen in commercial E. coli bacterins so prevalence is reduced through the use of a standard pre-farrow vaccination regime. Non-hemolytic, F4 negative isolates may still be ETEC strains and have toxin genes. These strains may not be included in commercially available products and have been shown to cause neonatal scours.

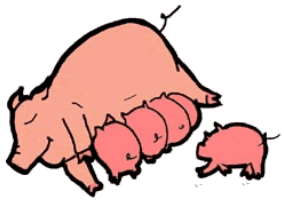
Serotyping or Genotyping?

Serotyping is a laboratory technique that uses antisera which has been produced against known ETEC serotypes in a slide agglutination assay. This provides identification of known ETEC serotypes identified by O serotypes and further classified by K and F serotypes.

Genotyping uses PCR methodology to confirm whether isolates possess specific genes that are associated with pathogenicity as detailed in the following table.

Enterotoxin Genes	Fimbrial Adhesion Factors	Adherence Factors
LT, Sta, STb and EAST1	F4 (K88), F5 (K99), F6 (987P), F41 and F18 (post-weaning diarrhea and edema disease)	AIDA (adherence factor)

Why Do I Want to Know All of This?



Determining the root cause of neonatal diarrhea can be challenging and a thorough assessment of the factors associated with ETEC scours may help in developing an appropriate treatment regime. If no commercial biologic product is available, an autogenous bacterin with single or multiple ETEC serotypes may provide an effective solution.

Further Reference: If you want more information about E. coli infections, try www.ecl-lab.com (University of Montreal's E. coli Laboratory website).

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