Wisconsin Veterinary Diagnostic Laboratory
UNIVERSITY OF WISCONSIN–MADISON

Bovine Scour Panel Diagnostic Aid

Diagnostic testing can be challenging when it comes to selecting the appropriate scour panel for investigation of diarrhea in cattle. Selection of the appropriate scour panel is important for result interpretation and how to apply the results to the clinically ill animal and other members of the herd. The WVDL offers a variety of different Bovine Scour Panels, below are detailed descriptions of each panel and recommendations on choosing the appropriate panel.

Scour Panel A: This panel detects bovine rotavirus, bovine coronavirus, and *Cryptosporidium parvum*.

Consideration: This panel tests for the three infectious agents that are found with the highest frequency in cases of neonatal calf diarrhea.

Scour Panel B: This panel detects bovine rotavirus, bovine coronavirus, *Cryptosporidium parvum*, and *Salmonella* spp.

Consideration: Recommended for calves between 7 and 120 days of age. Scour panel B should also be chosen when the submitting veterinarian suspects either **winter dysentery or salmonellosis** in juvenile or adult animals. This panel can be used for adult animals as well.

Scour Panel C: This panel tests for bovine rotavirus, bovine coronavirus, *Cryptosporidium parvum*, *Salmonella* spp., and 3 highly important enterotoxigenic *E. coli* (ETEC) virulence factors. The virulence factors tested for in this panel are the genes encoding for F5 (K99)- related fimbriae, F41- related fimbriae, and the heat-stable enterotoxin “a” (STa).

Consideration: Recommended for calves less than 7 days of age. It is very important that this panel is selected for calves that develop profuse diarrhea starting at 1-4 days of age.

Important information regarding Enterotoxigenic *E. coli* (ETEC):

Outbreaks of ETEC can be quite dramatic and extremely stressful for everyone involved. WVDL data collected in 2024 to 2025, from 15 different dairy operations located in four different states, found that 5 of 15 (33%) of confirmed ETEC outbreaks (90-100% morbidity in 1–3-day old calves) did not possess either the F5 (K99) or F41 virulence factor genes. However, the heat-stable enterotoxin “a” gene (STa) was detected in the fecal samples. This finding calls into question the efficacy of bovine colostrum harvested from cows immunized with commercial scours vaccines or calves

that receive anti-F5 (K99) antibody in preventing ETEC outbreaks. The WVDL is speculating that adhesins other than F5 (K99) are being used by *E. coli* to attach to enterocytes. There are many (>6) different adhesins that have been found in *E. coli* in addition to F5 (K99). The exact role of those adhesins remain unclear. For further investigations of *E. coli* virulence factors the WVDL offers an *E. coli* Virulence Factor PCR panel. This assay detects the following virulence genes: F5 adhesin (K99), intimin protein (eaeA), F41 adhesin (F41), heat-stable "a" toxin (STa), Shiga-like toxin 1 (Stx1), and Shiga-like toxin 2 (Stx2). The WVDL stresses the importance that this virulence factor panel is designed for *E. coli* toxin genes found in bovines and other animal species, but the panel will not test for some of the common toxin genes found in other non-bovine species.

The article, "**A systematic review and meta-analysis of the epidemiology of pathogenic *Escherichia coli* of calves and the role of calves as reservoirs for human pathogenic *E. coli***", reviewed studies published between 1951 and 2013 reporting the presence of virulence associated factors (VAFs) in calf *E. coli*. Together, 106 papers with 25,982 *E. coli* isolates from 27 countries assessed for *E. coli* VAFs. The prevalence of VAFs or *E. coil* pathotypes were compared between healthy and diarrheic animals and was analyzed. F5, and F41 fimbriae as well as heat-stable enterotoxin (STa) - VAFs of enterotoxigenic *E. coli* (ETEC) were shown to be highly and significantly associated with calf diarrhea. The chart below is a consolidation of information from this article and provides a further look at the significant prevalence of *E. coli* virulence factors associated with neonatal calf diarrhea.

Neonatal Calf Diarrhea: *E. coli* Virulence Factors

Virulence Factor	Scour No.	Healthy No.	Chi-square	P value	Odds Ratio	P value
F5 (K99)	719/5556 (12.9%)	42/1855) (2.3%)	169.9	<0.0001	6.4	<0.0001
F17	735/2328 (31.6%)	231/854 (27.1%)	4.5	=0.015	1.2	<0.014
F41	293/2030 (14.4%)	6/991 (0.61%)	142.8	<0.0001	27.7	<0.0001
ST1 (a)	172/2178 (7.9%)	7/1261 (0.56%)	15.4	<0.0001	15.4	<0.0001
ST2 (b)	50/1043 (4.8%)	0/806 (0.00%)	39.7	<0.0001	82.0	<0.0001
stx1	745/3562 (20.9%)	677/3577 (18.9%)	4.48	=0.03	1.1	=0.0001
stx2	402/3562 (11.3%)	654/3577 (18.3%)	69.3	<0.0001	0.57	<0.0001
Afa (afimbrial adhesins)	423/1384 (30.6%)	1/79 (1.3%)	31.1	<0.0001	24.2	=0.0016
eaeA (intimin)	1203/9779 (12.3%)	856/4295 (19.9%)	138.1	<0.0001	0.56	<0.0001

Source: Kolenda R, Burdukiewicz, M, Shierack P. A systemic review and meta-analysis of the epidemiology of pathogenic *Escherichia* coli of calves and the role of calves as reservoirs for human pathogenic *E. coli.* (2015) Front. Cell. Infect. Microbiol. 5:23 doi: 10.3389/fcimb.2015.00023

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Important information regarding *Salmonella* spp.:

The WVDL has a workflow for the identification of *Salmonella* spp. utilizing molecular detection, culture, serogroup identification, and serotyping. This workflow was created based on existing data from published literature and data collected at the WVDL. We have analyzed the data collected from 2014-2020 to provide clients with a better understanding of why the WVDL has implemented the current *Salmonella* testing scheme.

The WVDL uses real-time PCR to identify *Salmonella* nucleic acid and traditional culture methods to obtain live *Salmonella* isolates, which can be used for serotyping.
The *Salmonella* species PCR targets the *Salmonella* genus and the assay uses conserved genes common to all *Salmonella* species including *Salmonella enterica* subspecies *enterica*. The WVDL continues to culture the buffered peptone water (BPW) solution that was used for *Salmonella* PCR testing when the result values are ≤ 35.0 Ct (cycle thresholds) for an additional cost. Antimicrobial susceptibility testing can be performed, but there are limited interpretations and susceptibility testing is not recommended.

Please see the **Salmonella PCR and Culture Diagnostic Aid** page under the "Resources" section of WVDL's website for more information on Salmonella testing and results interpretations.