Development and Verification of a *Salmonella* Quantification Methodology for Beef Cecal Swabs and Ceca Contents Utilizing Hygiena's BAX® System SalQuant®

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BAX® System Q7

INTRODUCTION:

Beef ceca has been found to be a reservoir for *Salmonella*, but the actual contribution of ceca contents to carcass and trim contamination can only be evaluated if the load of *Salmonella* is determined by novel methodologies such as the BAX® System SalQuant®, which can serve to make actionable decisions to reduce *Salmonella* levels before product reaches the consumer.

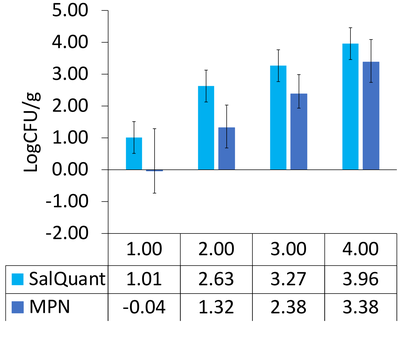
PURPOSE:

To develop and assess the performance of a rapid enumeration method for *Salmonella* in beef cecal swabs and ceca contents utilizing the BAX System SalQuant.

METHODS:

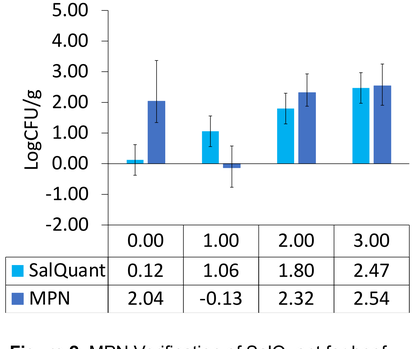
Beef cecal swabs (n=50) and ceca contents (n=50) were obtained from a commercial beef processing facility and pre-screened for *Salmonella*. Swabs (n=16) were spiked with 0.00 to 4.00 Log CFU/mL and ceca content samples (n=28) with 0.00 to 8.00 Log CFU/mL of *Salmonella* Typhimurium with three biological replicates per level, respectively. Swab processing involved the addition of 50 mL BAX MP media and homogenization. Ceca content sample processing consisted of combining a 10 mL aliquot of primary enrichment with 10 mL BAX MP media. Swabs and ceca content samples (low level) were incubated at 42 ˚C for 6, 8, and 10 hours of recovery; five technical replicates were tested using BAX System Real-Time *Salmonella* Assay. Linear fit equations were created at each timepoint utilizing Cycle Threshold (CT) values to estimate pre-enrichment levels of *Salmonella*. The timepoint utilized for BAX System SalQuant was determined with R^2 (≥ 0.70) using JMP® v. 15. Estimations were compared to MPN through 95% confidence intervals.

RESULTS:



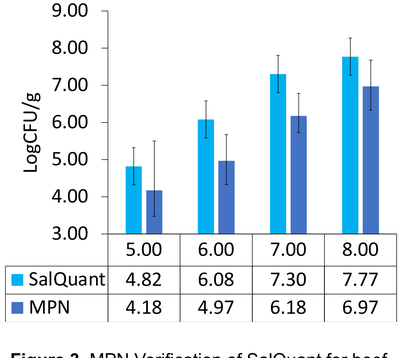
	1.00	2.00	3.00	4.00
SalQuant	1.01	2.63	3.27	3.96
MPN	-0.04	1.32	2.38	3.38

Figure 1. MPN Verification of SalQuant for beef cecal swabs



	0.00	1.00	2.00	3.00
SalQuant	0.12	1.06	1.80	2.47
MPN	2.04	-0.13	2.32	2.54

Figure 2. MPN Verification of SalQuant for beef ceca contents at low level of inoculation



	5.00	6.00	7.00	8.00
SalQuant	4.82	6.08	7.30	7.77
MPN	4.18	4.97	6.18	6.97

Figure 3. MPN Verification of SalQuant for beef ceca contents at high level of inoculation

Table 1. SalQuant Curve Development Parameters for Beef Cecal Swabs and Beef Ceca Contents at Low and High Level

Matrix	Timepoint (h)	R^2	Log RMSE*	Enumerable Range
Beef Cecal Swabs	8	0.79	0.52	1.00 - 3.00 LogCFU/g
Beef Ceca Contents (Low)	8	0.72	0.61	0.00 - 3.00 LogCFU/g
Beef Ceca Contents (High)	0	0.85	0.47	5.00 - 9.00 LogCFU/g

*Log Root Mean Square Error

All linear-fit equations for cecal swabs and ceca contents (low and high inoculation levels) met statistical parameters with R^2 ranging from 0.72 – 0.85 and Log RMSE from 0.47 to 0.61. SalQuant and MPN estimations were not statistically different in inoculated samples.

SIGNIFICANCE:

These results show that the BAX System SalQuant is a potential tool for beef processing facilities to estimate loads of *Salmonella* in beef cecal swabs and ceca contents, which can help reduce risk in final product and guide data-driven food safety decisions with pre-harvest implications.