



Verification of MicroTally® Beef Swabs with the BAX® System Real-Time PCR Assay for Highly Pathogenic *Salmonella*

Introduction

Salmonella is a significant foodborne pathogen across many food commodities, including poultry, beef and other raw protein sources. While more commonly associated with poultry, it remains a relevant hazard in beef, where contamination can be widely distributed during processing, particularly in ground products. Even low levels of contamination pose a public health risk. There are more than 2,500 known *Salmonella* serotypes, but their virulence and potential to cause human illness can vary considerably. Published data indicates that approximately 90% of human salmonellosis is attributed to a relatively small subset of serotypes (1). Evaluating rapid detection methods that provide insights into the pathogenicity profile of a sample can support accurate risk assessment and effective mitigation of adverse public health outcomes.

Sample Preparation and Enrichment

Three *Salmonella* serotypes were selected based on relative pathogenicity: *Salmonella* Newport (High), *Salmonella* Muenchen (Moderate), and *Salmonella* Montevideo (Low). Each strain was grown overnight at 35 °C in Brain Heart Infusion (BHI) broth. The following day, cultures were serially diluted (10-fold), plated and held at 4 °C until enumeration was complete.

MicroTally® swabs were used to swab raw beef trim and then inoculated with aliquots of each *Salmonella* culture to create 6 low-level replicates per serotype, expected to yield fractional positive results. Three uninoculated samples were included for negative controls. All samples were equilibrated at 4 °C for 24 hours to acclimate the target organism in the matrix.

Samples were then enriched with 200 mL of pre-warmed (42 °C) BAX MP media, homogenized and incubated at 42 °C for 8-24 hours. Sample aliquots were removed at 8, 10 and 24 hours and analyzed using the BAX® System method.

Method

BAX System Method

All samples were processed following the procedures described in the Product Instructions for the BAX System Real-Time PCR Assay for Highly Pathogenic *Salmonella* (KIT2048).

Reference Method

All samples were confirmed by culture, regardless of BAX System results, following the USDA FSIS MLG 4.15.

Results

The BAX System Real-Time PCR assay for HPS returned 5/6 positive results for each of the three *Salmonella* serotypes, resulting in 15/18 positive low-level samples. The expected high, moderate and low (H, M, L) designations were correctly assigned. All uninoculated controls returned negative results. Compared to culture, there was 100% agreement with no false positives or false negatives.

**Table 1. BAX System Method Presumptive vs. Confirmed Results**

MicroTally – Highly Pathogenic <i>Salmonella</i>						
Inoculating Strain	CFU/Test Portion	N	BAX System Presumptive			Confirmation
			8 h	10 h	24 h	
N/A	Control	3	0	0	0	0
<i>Salmonella</i> Newport	0.45	6	5 (H)	5 (H)	5 (H)	5 (H)
<i>Salmonella</i> Muenchen	0.61	6	5 (M)	5 (M)	5 (M)	5 (M)
<i>Salmonella</i> Montevideo	0.51	6	5 (L)	5 (L)	5 (L)	5 (L)

H – High pathogenicity. Detection of 2 or more HPS targets

M – Moderate pathogenicity. Detection of Target B or Target X

L – Low pathogenicity. Detection of *Salmonella* spp. or Target A

Conclusions

Overall, this study demonstrates that the BAX System Real-Time PCR assay for Highly Pathogenic *Salmonella* provides reliable and accurate detection for MicroTally swabs across serotypes with high, moderate, and low pathogenicity. With 100% sensitivity and 100% specificity, this method is an effective approach for rapidly screening and identifying the pathogenicity profile of the *Salmonella* present in the sample, even at low concentrations.

- **Homogenize 1 MicroTally swab with 200 mL of pre-warmed (42 °C) BAX MP media and incubate at 42 °C for 8-24 hours.**

References

1. Judd, M. C., R. M. Hoekstra, B. E. Mahon, P. I. Fields, K. K. Wong. Epidemiologic patterns of human *Salmonella* serotype diversity in the USA, 1996-2016. *Epidemiol Infect.* 2019 May 2;147:e187. doi: 10.1017/S0950268819000724.

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