

# Validation of the Thermo Scientific SureTect Real-Time PCR Method for Detection of *Salmonella* in Food and Environmental Samples

Jonathan Cloke<sup>1</sup>, Dorn Clark<sup>2</sup>, Roy Radcliff<sup>2</sup>, Carlos Leon-Velarde<sup>3</sup>, Nathan Larson<sup>3</sup>, Keron Dave<sup>3</sup>

<sup>1</sup>Thermo Fisher Scientific, Basingstoke, Hampshire, RG24 8PW, UK, <sup>2</sup>Marshfield Food Safety, 1000 North Oak Avenue, Marshfield, Wisconsin, 54449, USA, and <sup>3</sup>Agriculture and Food Laboratory, University of Guelph, Guelph, Ontario, N1H 8J7, Canada

## Overview

**Purpose:** To validate the Thermo Scientific™ SureTect™ *Salmonella* species Assay according to AOAC Research Institute (RI) *Performance Tested Methods*<sup>SM</sup> validation criteria.

**Methods:** The SureTect method was compared to the reference method detailed in ISO 6579:2002.

**Results:** The SureTect *Salmonella* species assay reliably detected the presence of *Salmonella* in a wide variety of matrices.

## Introduction

The Thermo Scientific SureTect *Salmonella* species Assay (PT0100A) is a new Real-Time PCR test for the detection of *Salmonella* from food, animal feeds and environmental samples, which combines pre-dispensed lysis reagent and lyophilised, tableted PCR reagents to simplify and improve assay handling, along with dedicated software to run the assays as well as interpret and display PCR results. This study was conducted using the AOAC RI *Performance Tested Methods*<sup>SM</sup> program<sup>1</sup> to validate the SureTect *Salmonella* species assay in comparison to the reference method detailed in ISO 6579:2002<sup>2</sup> with a variety of food matrices.

FIGURE 1. The Thermo Scientific SureTect System.



## Methods

### Sample Preparation

Bulk samples of foods were screened for natural contamination with *Salmonella* before splitting into three samples; unspiked (control), low spiked (0.2-2 CFU/25g) and high spiked (2-5 CFU/25g) samples. Once spiked, all samples were allowed to equilibrate as per AOAC instructions.

Surface samples of stainless steel were spiked with a suspension of *Salmonella*. Where samples were not paired as in the case of surface samples and raw ground beef analysis with the 8h enrichment protocol, additional separate samples were prepared.

### SureTect Assay Method

25g samples of foods and surface sponges were added to 225ml of room temperature Buffered Peptone Water (BPW) (ISO), with the exception of raw ground beef with the short 8h protocol, where pre-warmed BPW (ISO) was used. Samples of raw ground beef analysed with the short protocol were incubated at 41.5°C for 8h, non-fat dried milk, environmental surfaces, raw beef and liquid egg were incubated at 37°C for 18h and cooked shrimps, Frankfurters, lettuce and raw chicken for 20h at 37°C.

Following enrichment 10µl of each sample was added to the prefilled SureTect Lysis Tubes (prepared by additionally adding Proteinase K Reagent) and the sample lysed according to the SureTect lysis protocol (37°C for 10 minutes followed by 95°C for 5 minutes).

Once lysed, 20µl of the lysate was added to the SureTect PCR Tubes, which contain lyophilised PCR reagents before running on the Thermo Scientific™ PikoReal™ Real-Time PCR instrument.

Assay results were automatically interpreted as “positive” or “negative” by the SureTect Software.

All SureTect results were confirmed culturally using the SureTect confirmation method of direct plating onto Oxoid™ *Brilliance*™ *Salmonella* Agar and confirming presumptive positive purple colonies with the Oxoid™ *Salmonella* Latex Kit (DR1108A) and additionally using the reference method confirmation protocol.

### ISO Reference Method

The reference method detailed in ISO 6579:2002 was followed, using *Brilliance* *Salmonella* Agar as the second plating medium. Confirmations were performed using the Remel™ microID™ kit or bioMérieux API™ 20E kit, Triple Sugar Iron (TSI) slants and poly-O and poly-H antisera.

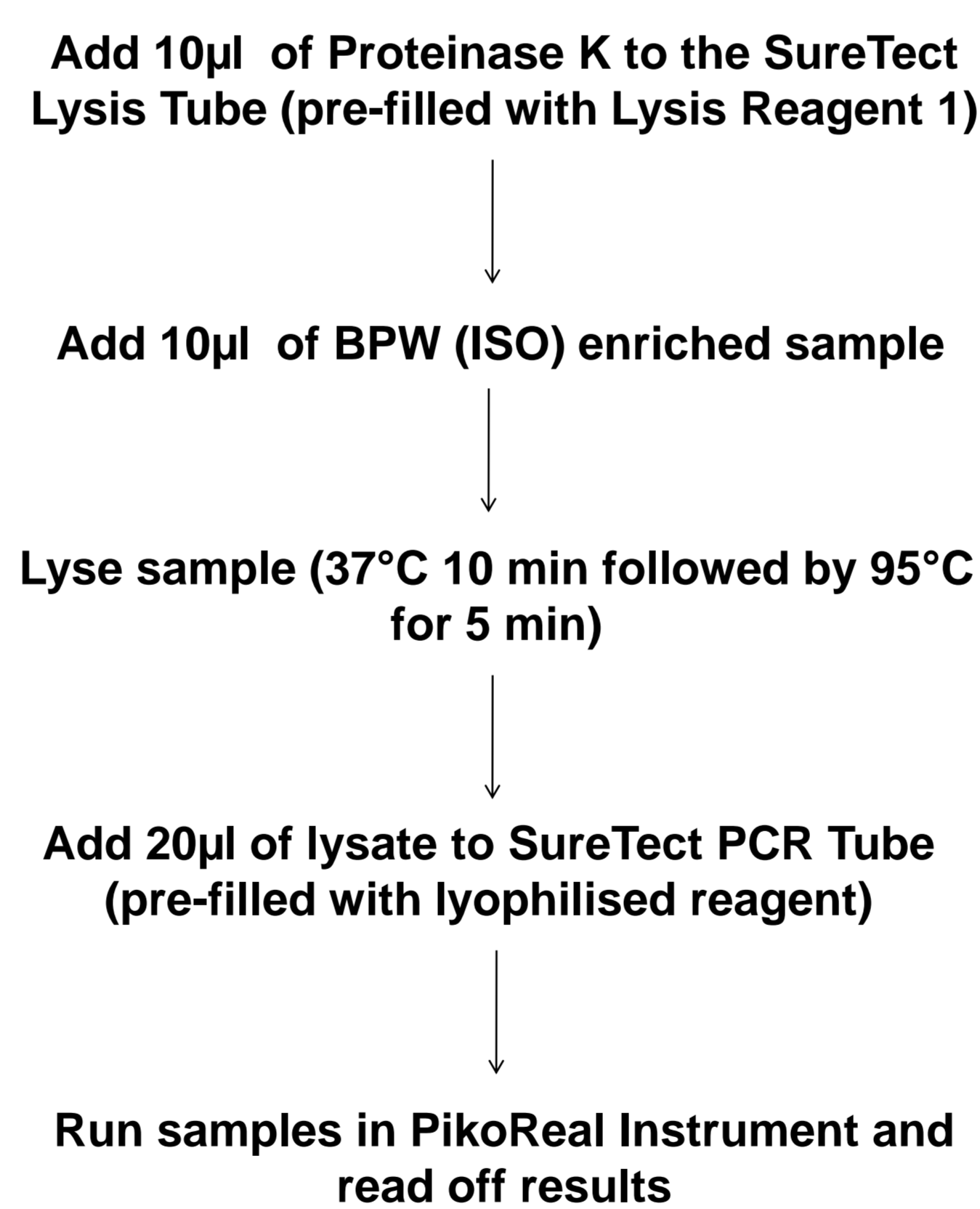
### Inclusivity

One-hundred and seventeen *Salmonella* isolates covering a wide variety of O- serogroups and subspecies were cultured in BPW (ISO) and analysed at a level of approximately 10<sup>4</sup> CFU/ml using the SureTect assay protocol according to AOAC-RI PTM requirements.

### Exclusivity

Thirty-six exclusivity isolates were cultured in TSB for 18-24 hours and analysed at a level of approximately 10<sup>8</sup>CFU/ml using the SureTect assay protocol according to AOAC-RI PTM requirements.

FIGURE 2. SureTect Assay Workflow.



## Results

### Inclusivity and exclusivity

All 117 *Salmonella* isolates were detected as positive by the SureTect Software. None of the 36 exclusivity isolates were detected by the SureTect Software.

FIGURE 3. Inclusivity of the SureTect *Salmonella* species Assay.

Serotype	Number	% Positive
<i>Salmonella bongori</i>	4	100%
<i>Salmonella enterica</i> subsp. <i>salamae</i>	5	100%
<i>Salmonella enterica</i> subsp. <i>arizoniae</i>	3	100%
<i>Salmonella enterica</i> subsp. <i>diarizoniae</i>	4	100%
<i>Salmonella enterica</i> subsp. <i>enterica</i>	101	100%

### Food Matrix Analysis

No statistically significant difference, by probability of detection analysis (POD), was seen for any of the ten food matrices and the environmental surface evaluated in this PTM study during either the method developer or independent laboratory studies between the ISO reference method or the SureTect *Salmonella* species assay.

FIGURE 3. Method Developer Results for the ISO and SureTect *Salmonella* species Methods.

Matrix/Inoculating Organism	Level	MPN/25g	No. Test portions	ISO	SureTect	
					Presum*	Con*
Raw chicken breast <i>Salmonella</i> Indiana	Low	1.2	20	13	12	12
	High	2.3	5	5	5	5
Raw ground pork <i>Salmonella</i> Livingstone	Low	0.68	20	11	11	11
	High	2.5	5	4	4	4
Non-fat dried milk/ <i>Salmonella</i> Infantis	Low	1.2	20	15	15	15
	High	4.5	5	5	5	5
Pork Frankfurters <i>Salmonella</i> Poona	Low	0.38	20	8	8	8
	High	0.55	5	3	3	3
Cooked shrimp <i>Salmonella</i> SaintPaul	Low	1.3	20	13	13	13
	High	4.5	5	5	5	5
Stainless steel surface <i>Salmonella</i> Newport & <i>E. coli</i>	Low	N/A	20	16	16	16
	High	N/A	5	5	5	5
Ready to eat meal <i>Salmonella</i> Enteritidis	Low	1.3	20	15	15	15
	High	4.5	5	5	5	5
Lettuce <i>Salmonella</i> Anatum	Low	1.0	20	14	13	14
	High	1.5	5	4	4	4
Raw ground beef (short 8h protocol) <i>Salmonella</i> Typhimurium	Low	0.63	20	10	8	11
	High	2.3	5	5	4	5
Raw ground beef (standard protocol) <i>Salmonella</i> Typhimurium	Low	0.63	20	10	9	11
	High	2.3	5	5	5	5
Pasteurised liquid egg <i>Salmonella</i> Virchow	Low	0.58	20	8	8	8
	High	1.35	5	3	3	3

\* Presumptive (Presum) and Confirmed (Con) SureTect results

FIGURE 4. Independent Laboratory Results for the ISO and SureTect *Salmonella* species Methods.

Matrix/Inoculating Organism	Level	MPN/25g	No. Test portions	ISO	SureTect	
					Presum*	Con*
Lettuce <i>Salmonella</i> Thompson	Low	0.73	20	10	10	9
	High	2.97	5	5	5	5
Pork Frankfurters <i>Salmonella</i> Vellere	Low	0.48	20	7	7	7
	High	2.97	5	5	5	5
Stainless steel surface <i>Salmonella</i> Berta & <i>E. coli</i>	Low	N/A	20	14	14	14
	High	N/A	5	5	5	5

\* Presumptive (Presum) and Confirmed (Con) SureTect results

## Conclusion

The SureTect *Salmonella* species Assay was shown to be an accurate and user-friendly method, due to the use of pre-dispensed lysis reagent, tableted PCR reagents and automatic interpretation of results. Results from a wide range of foods, including challenging matrices, demonstrated the assay was able to reliably detect the presence of *Salmonella*.

## References

- AOAC International, Method Committee Guidelines for Validation of Microbiological Methods for Food and Environmental Surfaces 2012.
- ISO, Microbiology of Food and Animal Feeding stuffs- Horizontal Method for the Detection of *Salmonella* spp. ISO 6579:2002.

© 2013 Thermo Fisher Scientific Inc. All rights reserved. API is a trademark of bioMérieux SA. Performance Tested Methods is a service mark of AOAC-RI. All other trademarks are the property of Thermo Fisher Scientific Inc and its subsidiaries. This information is not intended to encourage use of these products in any manner that might infringe the intellectual property rights of others. Folio number LT2085A, 05/13