Pathogen testing, pure and simple.

The Study

A study from the Pathogen Research Centre at Nottingham Trent University, Nottingham, UK has confirmed the ability of the 3M™ Molecular Detection System to identify a variety of common foodborne pathogens—even at extremely low numbers.

Headed by Professor Steve Forsythe, who has extensive experience isolating and identifying foodborne bacterial pathogens, the study tested the system's effectiveness specifically for *Salmonella* and *Listeria* spp., two of the most serious pathogens in the food industry.

The easy-to-use system, which combines isothermal DNA amplification with bioluminescence detection, was found to be a rapid and robust method of detecting the target organisms.

Prof. Steve Forsythe

Steve Forsythe is Professor of Microbiology at Nottingham Trent University. He authored "The Microbiology of Safe Food" and 50 papers on foodborne pathogens and their detection. He is on the Food Standards Agency "Advisory Committee for Animal Feedingstuffs" and former advisor to FAO/WHO and EFSA.

Study Results[1]

- The system "positively detected … *Salmonella* serovars and *L. monocytogenes; Salm. enterica* serovars Typhimurium NCTC 74, *Salm.* Enteritidis NCTC 3046, *Salm.* Ealing, and *Listeria monocytogenes* NCTC 10527, and *L. monocytogenes* NCTC 7973."
- "We found it remarkable that the detection of such low numbers of *Salmonella* cells was achieved within 45 minutes."
- "… the equipment has the benefit of being able to detect different target organisms at the same time."
- The system used a procedure "which a reasonably competent laboratory worker could operate." And using the system "… would result in reduced labour-time, consumables and associated costs."

[1] *Use of the 3M™ Molecular Detection System for Salmonella and Listeria spp.* Forsythe, Prof. Steve; Pathogen Research Centre, School of Science and Technology, Nottingham Trent University, Clifton Lane, Nottingham, UK

"… the 3M™ Molecular Detection System combined

ease of use, reliability and remarkable rapidity

into a unit with a small footprint. The ability to use the same unit for different target organisms … is a significant addition towards food safety."

Download a pdf of the complete study at
3M.com/3MMolecularDetectionSystem/PForsythe

3M

Use of the 3M™ Molecular Detection System for *Salmonella* and *Listeria spp.*

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Current detection of foodborne pathogens entails a stepwise approach of pre-enrichment, enrichment, inoculation of selective agar, presumptive identification and confirmation. Each step may require an overnight incubation period which results in delayed release of products, shortening their shelf-life and quality for the consumer. The 3M™ Molecular Detection System was tested for the detection of *Salmonella* serovars Enterica, Typhimurium & Ealing, and *Listeria monocytogenes* after the pre-enrichment step as a potential screening method for the food industry. Testing included detecting the named target organisms which had been used to spike non-sterile milk and minced meat samples in order to include the presence of intrinsic organisms, and complications due to the food matrix (i.e. proteins and fats).

The 3M™ Molecular Detection System positively detected the laboratory cultures of *Salmonella* serovars and *L. monocytogenes*; *Salm. enterica* serovars Typhimurium NCTC 74, *Salm.* Enteritidis NCTC 3046, *Salm.* Ealing, *Listeria monocytogenes* NCTC 10527, and *L. monocytogenes* NCTC 7973. This was achieved both in pure cultures within 12–30 minutes after the start of the analysis and was well within the pre-set maximum test run of 75 minutes. *Salmonella* serovars and *L. monocytogenes* were also detected in the presence of mixed intrinsic flora of pasteurised milk and minced meat. The intrinsic flora had grown during pre-enrichment to levels in the order of 10^9–10^{10} cfu/mL and greatly outnumbered the target organisms by several orders of magnitude. The food matrixes of milk and minced meat did not interfere with the end-detection of the target organisms. The 3M™ Molecular Detection System, therefore, has the potential to screen samples after the pre-enrichment stage such that only positive samples are further analysed through the further stages to colony isolation. Given the majority of samples are negative for *Salmonella* and *Listeria* spp., screening for positive samples after pre-enrichment would reduce the need for further analysis and costs associated with the preparation and inoculation of enrichment broths and selective agars.

A preliminary detection limit was determined using decimal dilutions of the target organisms. This was in the order of 10^3 colony forming units, in the Lysis Solution Tube. It was deemed highly significant that this small number of organisms were detectable within 45 minutes after starting the test. Although such enumeration after pre-enrichment in itself is not a requirement, it does reflect that the method can detect target organisms at low numbers which may not have grown extensively during the pre-enrichment stage, and therefore considerably out-numbered by non-target organisms. Such a result is clearly highly desirable, and reflects the benefits of the change to DNA sequence-based detection methodology in food microbiology.

Results

Using 20µl aliquots of overnight cultures (10^9–10^{10} cfu/mL), the system gave a positive result for *Salmonella* Enterica serovars Enteritidis, Typhimurium & Ealing and *Listeria monocytogenes*. This preliminary experiment was for familiarity and basic confirmation of the system. Figures 1a–1e show the characteristic light curve for a positive detection for the five target organisms. The amount of light increases due to bioluminescence and then decreases.

Figure 1a: *L. monocytogenes* NCTC 10527 detection

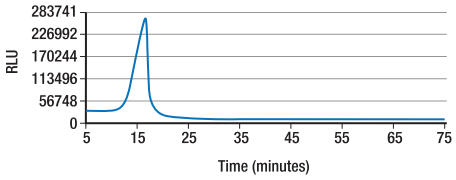


Figure 1b: *L. monocytogenes* NCTC 7973 detection

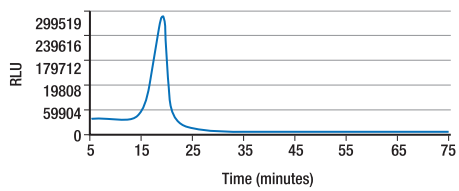


Figure 1c: *Salm.* Enteritidis NCTC 3046 detection

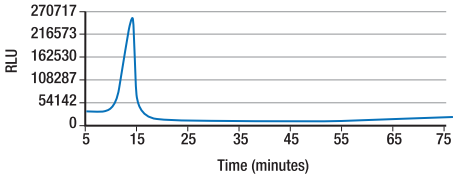


Figure 1d: *Salm.* Typhimurium NCTC 74 detection

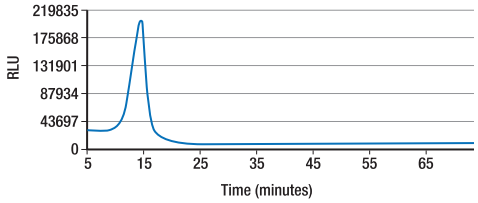
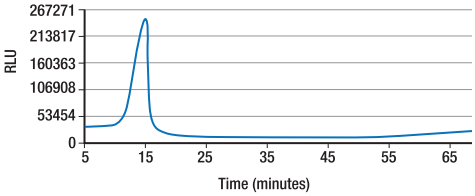


Figure 1e: *Salm.* Ealing detection



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