

Rapid detection of toxin-encoding *Bacillus cereus*

Teagasc is seeking partners within the diagnostics industry to exploit a novel qPCR-based test capable of rapid, simultaneous detection of all *Bacillus cereus* toxin encoding genes (“CereusToxTest”), of benefit to the food industry.

Summary

Teagasc researchers have developed a novel q-PCR based assay capable of rapid, simultaneous detection of all *Bacillus cereus* toxin encoding genes. This assay offers significant advantages in time and specificity compared to what is currently commercially available.

Value Proposition

Rapid and reliable detection of this target species is necessary to identify *B.cereus*-contaminated food and thereby reduce/prevent such food poisoning outbreaks in consumers, and lessen economic losses and reputational damage to food producers, caused by such recalls and/or outbreaks.

Bacillus cereus is a pathogenic, spore-forming soil-dwelling bacterium that is commonly encountered in raw milk and subsequent dairy products. It is resistant to industrial pasteurisation processes due to the presence of endospores and is therefore a major concern for the dairy industry. The various strains of *B.cereus* produce several potentially pathogenic substances, linked to foodborne emetic and diarrhoeal syndromes and are known causative agents of food poisoning for over forty years. The emetic syndrome is caused by cereulide, (synthesised by a non-ribosomal peptide synthetase encoded by the *ces* gene), while the diarrhoeal syndrome is caused by at least three known heat-labile enterotoxins.

No commercially available kits (immunoassays or molecular kits) are capable of simultaneously detecting the 4 toxins produced. Existing assays either detect only a subset of toxins or do not reliably distinguish between *B.cereus* and closely related, harmless bacteria, leading to false negatives and positives, which this assay circumvents.

Solution

CereusToxTest is a probe-based qPCR approach to simultaneously detect and quantify levels of each of the 4 toxin gene types. It is a multiplex assay based on bespoke fluorophore-labelled probes, whereby

detection and quantification of the 4 toxins is possible in a 2 –hour real-time PCR run.

Competitive Advantage of Technology

1. Addresses the issues associated with the non-specificity (leading to false positives) or excessive specificity (detection of a subset of toxins only, leading to false negatives) of other tests.
2. More rapid than existing assays and avoids the need for downstream analysis, such as melting curve analysis and monitoring of PCR replicon size.
3. Offers simultaneous detection and quantification of all 4-toxin encoding gene types in a high throughput single assay. Toxin profiling may allow for more informed treatment options.

Status/Development Stage

Fully functional multiplex real-time PCR assay, available through licensing of know-how

Fields of Application

Development of kits for molecular biology/DNA-based diagnostics for testing of food production and processing environments, raw materials, foods and food ingredients to ensure food safety.

Funding

Teagasc Walsh Fellowship and Irish Dairy Levy



How to Proceed:

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