

AT-LINE MILK PROTEASE TESTING SUPPORTS PRODUCTION DECISION MAKING AND WASTE REDUCTION



Milk spoilage is a huge problem worldwide, leading to significant wastage and environmental impact as well as a great deal of unnecessary costs for milk producers. Drawing on NIZO's expertise, Detact Diagnostics has developed a new at-line testing solution that detects protease in UHT milk, delivering results in just 45 minutes. The easy-to-use system supports production decision making on shelf life for UHT milk, helping reduce waste, cost and emissions while improving product quality and brand reputation.

Accurate figures on milk spoilage are hard to come by, but it is widely accepted as a major issue in the dairy industry. Independent research has suggested as much as one-sixth of all milk produced globally is wasted, with half of this wastage occurring before the product even reaches the stores, representing millions of dollars of unnecessary costs for the global dairy industry.



The ability to determine the quality of a batch of milk, accurately predict its shelf life and potentially make informed decisions on the most suitable end application could greatly reduce the amount of waste in the dairy production chain. The dairy industry already expends a great deal of effort on quality checks throughout the chain. However, current solutions are often time consuming and require off-site analysis by third parties, slowing down decision making. Consequently, the dairy industry and particularly the quality control chain are looking for faster, more-affordable techniques that can be used on-site at production facilities and other key stages of the milk production chain for optimal decision making.

FAST, ACCURATE TESTING ENABLES IN-TIME DECISIONS

To address this need, Detact Diagnostic, with support from NIZO, has developed a novel sensitive, rapid and easy-to-use at-line protease activity assay for testing milk after pasteurisation. The EnzoTact[®]PRO assay detects proteases from spoiler bacteria contaminating the milk. These proteases survive even ultra-high temperature (UHT) treatment and can continue to breakdown proteins in the milk, causing sweet curdling. The EnzoTact[®]PRO assay can identify the levels of proteases in milk samples in just 45 minutes, allowing data-based decision making in real time.

EnzoTact[®]PRO is based on Detact's proven Visualisation by Infrared Peptide Reaction (VIPER) platform technology. This features a novel fluorescent peptide molecule that emits near infrared light when the peptide chain is exposed by a target protease. Near infrared light is much better suited to detection in milk samples than the ultraviolet light used in other commercial protease tests.

Milk Collection



Transported to processing plant



Milk stored before Pasteurisation



Milk to be sold as fresh
(HIGH protease activity)

EnzoTact[®] PRO
measures protease activity in
post-pasteurised milk



Milk Pasteurised



Milk safe to undergo UHT treatment
(LOW protease activity)



EnzoTact[®]PRO can be used as a QC step before
milk leaves facility



It can also be used to test recalled products

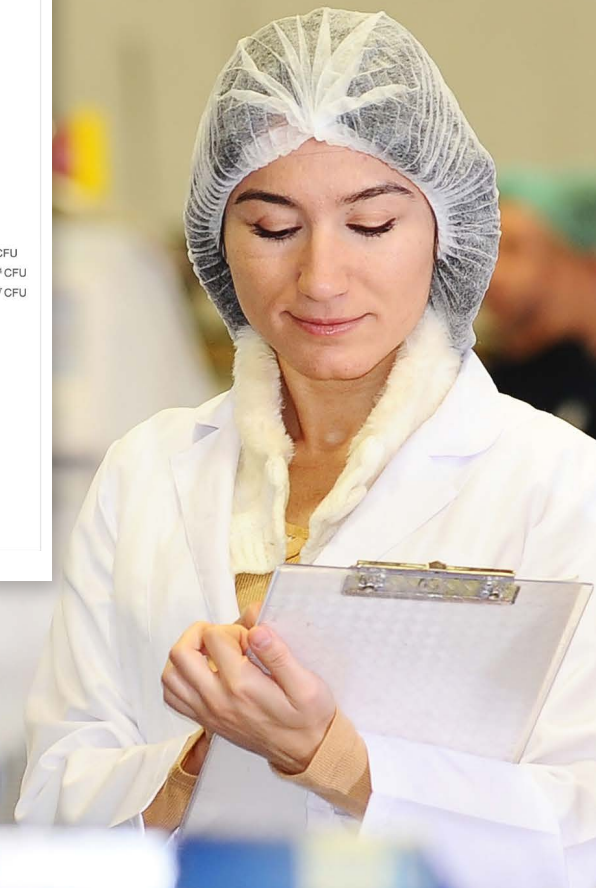
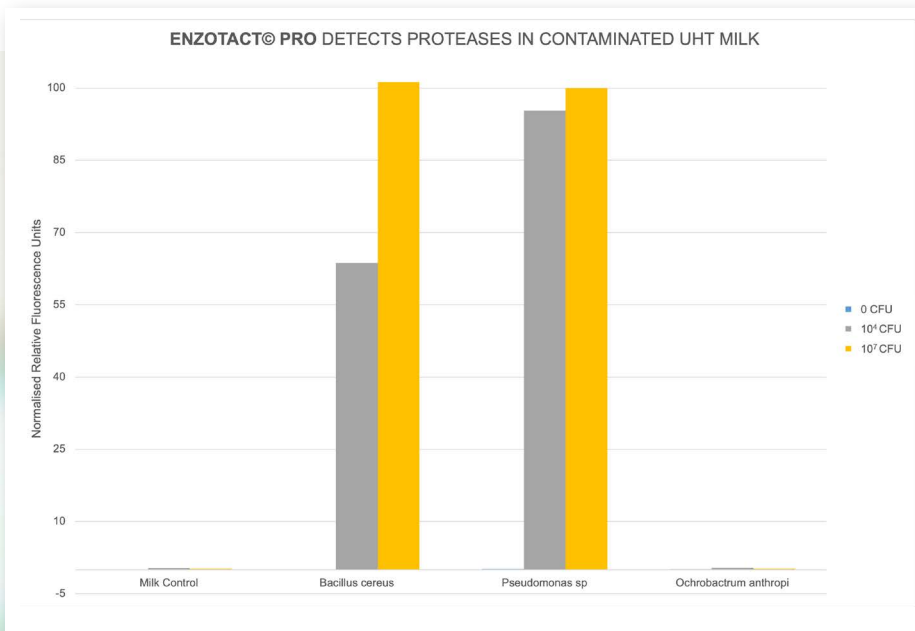
COLLABORATION OF COMPLEMENTARY SKILLS ACCELERATES INNOVATION

Milk composition can vary greatly from source to source and batch to batch. This makes it a highly challenging matrix for enzyme testing. To evaluate and optimize the EnzoTact[®]PRO assay and its VIPER technology for testing milk, Detact turned to the extensive dairy sector expertise of NIZO, a leading contract research organisation that supports dairy, food and health companies.

Drawing on NIZO's wide-ranging knowledge of both the dairy industry and food science, Detact and NIZO further developed the EnzoTact[®]PRO into a fast, simple-to-use assay that could be used by analysts in a typical UHT milk production facility's quality control lab. NIZO's insight into the unique effects of the milk matrix allowed test parameters such as the volume of the required sample to be optimised to ensure an acceptable limit of detection (LoD)

and limit of quantification (LoQ). In addition, NIZO helped Detact to optimize the assay results and develop a simple procedure for reading them out from the assay.

As a result, Detact were able to rapidly bring to market a novel concept for at-line protease testing that delivers reliable results while fitting in with existing quality control flows at milk processing plants. The simple three-step assay is compatible with standard quality control analysis equipment provides levels for target protease and bacterial load, with results being readout via a handheld reader. Sampling, analysis and readout all happen on site within 45 minutes, allowing facilities to decide whether further processing is required – for example identifying batches for sale as fresh, to undergo UHT processing or even to be diverted to other applications – based on accurate insight into the protease and bacterial load.



“Detact Diagnostics’s EnzoTact[®]PRO is a very sensitive yet easy-to-use enzyme activity assay based on a specially designed fluorescent compound that delivers an impressively low level of quantification in the complex milk matrix. By helping reduce spoilage, it could play an important role in improving the economics and sustainability of the milk production chain.”

Vesela Tzeneva, Senior Project Manager Food Safety & Fermentation at NIZO.



A PLATFORM TO REDUCE DAIRY WASTE FURTHER

The EnzoTact®PRO assay is now in use for post-pasteurisation testing at dairy production facilities around the globe, helping them benefit from higher production efficiency, reduced waste, improved sustainability and overall higher product quality. Detact is looking at extending the EnzoTact with additional rapid, on-site assays optimized for other points in the dairy chain. The first of these, EnzoTact®RAW targets psychrotrophic bacteria in raw cow's milk, again based on protease activity. By enabling better quality control and decision making on the farm, the new assay will take another step forward in reducing wastage throughout the dairy chain.



“NIZO were the perfect partner to support us in adapting our VIPER technology to the dairy sector and developing an easy-to-use assay for milk spoilage proteases. Their combination of scientific expertise, dairy industry knowledge and problem-solving attitude help speed up our innovation and achieve our development goals for the assay.”

Dr Matthew Burton, CTO, Detact Diagnostics

ABOUT NIZO

NIZO's wide-ranging expertise helps you successfully address your food challenge: from managing the protein transition or delivering real health benefits to maintaining food safety and scaling up to industrial production. Through multidisciplinary teams and a unique pilot production plant, we bring all the expertise together to deliver cost and time-to-market savings. And we are the only partner that can support you through the entire innovation process: from R&D to (pilot) production.

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**INNOVATING
TOGETHER**

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