

New five-minute milk scan for dairy industry

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Credit: AI-generated image ([disclaimer](#))

Lower costs, less wastage and higher-quality milk on the horizon for dairy farmers, thanks to a new optical sensor that scans for contaminants and proteins in 5 minutes.

Food safety is a pressing issue affecting food industries, and the [dairy industry](#) is no exception. Just like any other food type, [milk](#) and [milk products](#) can have an adverse effect on consumer health if contaminated.

Harmful microorganisms are usually introduced into the milk through udder infections (e.g. *Staphylococcus aureus*) or sanitation problems (e.g. *Escherichia coli*). But milk can also be contaminated with chemicals such as antibiotics, mycotoxins and pesticides through the water or feed that cows consume or through inadequate control of equipment and milk storage facilities. To prevent contaminated milk and [dairy](#) products from entering the food chain, tests are conducted throughout the production process.

Standard testing for milk quality and safety can be a costly and time-consuming process. The recently launched EU-funded project MOLOKO has found a way to dramatically reduce costs and the time it takes to detect contaminants in milk. Able to produce a reading in just 5 minutes, MOLOKO's new sensor provides an early warning system that may also lead to less milk wastage and antibiotic use in the dairy industry's production and processing stages.

Biosensor for on-site detection

The new optical sensor is constructed using four high-tech building blocks: organic light-emitting transistors, organic photodetectors, recombinant antibody technology and a nanostructured plasmonic surface. The last, a nanoplasmonic grating, is supported by powerful, label-free screening technology called surface plasmon resonance (SPR). Highly sensitive and non-invasive, SPR provides real-time information on how specific, pre-programmed receptors interact with selected bacteria, toxins, antibiotics and other contaminants.

"Detection and investigation of contaminants in fluids is a rapidly growing field in SPR bio sensing," says Italian National Research Council researcher and project coordinator Stefano Toffanin in a news item posted on the 'Photonics21' website. "Until recently optical constrains, high costs and limitations in the detected parameter number

prevented the use of SPR outside of a laboratory. Within our unique integrated sensing architecture, MOLOKO can deliver results in minutes, for advanced dairy analysis."

Suitable for use by technicians as well as non-specialists working at farms, the handheld biosensor scans for 10 contaminants (mycotoxins, antibacterial drugs and staphylococcal enterotoxins) and provides fast results on-site. The sensor system can also be integrated into a milking machine for inline detection.

Protein detection for high-quality cheese

The biosensor is also programmed to check for two proteins (kappa casein and lactoferrin) that measure milk and other dairy product quality. The kappa casein B-type milk protein, in particular, is valued in the cheese industry for its ability to clot quickly, producing high yields of firm cheese. Dairy processors therefore usually pay more for milk containing this protein.

Aided by the new optical sensor, farmers will be able to adjust their breeding programmes, by rearing cows that produce milk containing high-value proteins. "With this sensor system, farmers will be given an insight to understand the health of their cows, dairies will be able to make instant judgements about the contaminants in milk and processors can keep an eye on quality control," says Toffanin.

MOLOKO (Multiplex phOtonic sensor for pLasmonic-based Online detection of [contaminants](#) in milk) expects to have a prototype of the sensor ready by 2021.

More information: MOLOKO project website: www.moloko-project.eu/

Provided by CORDIS

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