Press Release

Photonics to help dairy industry with new 5-minute scan

A new optical sensor that can check the presence of contaminants in milk and produce a detailed reading in 5 minutes, is set to dramatically reduce costs, wastage and antibiotic use linked to the production, quality control, and processing phases in the dairy industry.

Scanning milk for 2 proteins and 10 contaminants simultaneously, the optical sensor will take measurements directly on-site at each point of the long and logistically-spread milk value chain.

Delivering a detailed reading in about 5 minutes, the sensor can look for any antibiotics ingested by the cows that have been transmitted to the milk. Using the collected information, companies can prevent contaminants, such as antibiotics and aflatoxin, from entering the food chain.

Across dairy farms today standard tests take days to perform, whereas this new palm-sized sensor will be the easiest way to check the presence of milk components (such as kappa-casein proteins) that are quality parameters for milk and other dairy products.

The same readout can help prevent food poisoning outbreaks like Staphylococcal enterotoxins (SEs) while at the same time predicting milk quality (Kappa Casein) and cow health (lactoferrin).

"With this sensor system", says project coordinator Stefano Toffanin, researcher at the Italian National Research Council (CNR) in Bologna, "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."

"Our sensor is a multi-parameter tool, based on innovative nano-photonic technologies. It is designed for detecting milk contaminants, and provides an inexpensive, early warning system. This will help the entire dairy industry to save time, millions of Euros and gallons of wastage," said Toffanin.

On Site Detection

Typically, a number of checks are required at nearly every stage of the production process to avoid any possible contamination of dairy products delivered to consumers, with samples often needing to be taken and sent away to a laboratory.

However with the new sensor system, milk samples can be analyzed by both technicians at the dairy plant level and farm-based users who are not experts, within a 5-minute period.

"The ability to monitor milk cheaply and regularly at point-of care means farmers and National Official Control Body can build up a data profile for animals, tracking health. Earlier intervention by famers and veterinarians can lead to prudent use of antimicrobials and an overall reduction of their use." Toffanin said.

Used as an offline, hand-held tool by non-specialists and technicians alike, the miniaturized sensor system can be integrated into a milking machine for inline detection.

Milk-processors check food-safety parameters upon delivery. When a batch is found to be contaminated, the processors must reject and destroy the product leading to serious financial losses for farmers.

"The innovative milk sensor system can be a valuable tool when implemented throughout the entire dairy supply chain. It contributes to contamination-free milk and dairy products, as well as significantly reducing waste and economic losses."

High Value Milk

Depending on the company and country, dairy processors will usually pay more for higher-fat and high-protein milk.

Kappa Casein B type is a milk protein that is extremely important in cheese making, for its ability to clot and form curds.

A cow with a Kappa Casein B type produces milk that clots quickly, as well as cheese that is much firmer than that made from cow with different genotypes.

Farmers can use this new optical sensor system to assist in breeding programs to deliver more valuable milk by identifying cows that produce high value Kappa Casein B type proteins.

Food safety parameters included in the analysis are antibiotics and mycotoxins as well as food quality parameters like kappa casein and lactoferrin.

Surface Plasmon Resonance

The system works by exploiting highly miniaturized organic optoelectronic devices with a grating supporting Surface Plasmon Resonances (SPR).

SPR are waves of free electrons at the surface of a metal. They are extremely sensitive to binding events occurring on the surface and can be excited and detected by a light beam impinging on the surface. Then, a change in the reflected intensity carries out information on the "in situ" interaction of specific, pre-programmed receptors with selected bacteria, toxins, antibiotics and, in general, with contaminants.

"Detection and investigation of contaminants in fluids is a rapidly growing field in SPR bio sensing. 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"

Going by the acronym 'MOLOKO', the consortium developing the sensor system expects to have a prototype ready in 3 years. MOLOKO is a Photonics Public Private Partnership project that secured €6 million of EC funding via the Horizon 2020 work programme.

Participants from eight EU and associated countries include: Consiglio Nazionale delle Ricerche (CNR), Plasmore SRL, Istituto Superiore di Sanità, Parmalat Spa, Milkline SRL (Italy); Stichting Wageningen Research (Netherlands); Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung E.V (Germany); Quadrachem Laboratories Limited (United Kingdom); Bewarrant (Belgium); nemzeti élelmiszerlánc-biztonsági hivatal – The National Foodchain Safety Office (Hungary); Teknologian tutkimuskeskus VTT Oy (Finland); CSEM Centre Suisse D'Electronique et de Microtechnique SA – Recherche et Developpement – the Swiss Center for Electronics and Microtechnology (Switzerland).

About MOLOKO

www.moloko-project.eu

About Photonics21

Photonics21 is the European Technology Platform (ETP) for photonics, a technology encompassing all of the products and processes around the emission, manipulation and detection of light. Photonics is integral to a wide range of industries that include the medical, healthcare, transport, manufacturing, and telecommunications sectors.

"Photonics21" was set up in December 2005 to bring the community of photonics researchers and industries together. The European Commission defined photonics as one of six European Key Enabling Technologies (KET's) in September 2009. Shortly after, the European Research & Innovation Program "Horizon 2020" invited Photonics21 to become a "Public Private Partnership" (PPP). The "Photonics 21 Association", a legal entity under Belgium law, became the private contract partner in November 2013 in a Public Private Partnership (PPP) in conjunction with the EU Commission.

Today Photonics21 represents more than 3000 personal members from across Europe and abroad. Our members are experts in the photonics industry, research organisations and universities who actively engage with us to develop a joint photonics strategy for future research and innovation in Europe.

With the global photonics market growing from €350 Billion in 2011 to €447 Billion in 2015, Photonics remains a strong industry. The European photonics industry, estimated to be worth €70 billion, has considerable global leadership positions and employs over 300,000 people directly.

With positive growth forecast, current industry trends like digitalisation, resource efficiency, individual and zero failure production will drive the photonics industry further.

Contact

W: http://www.photonics21.org

E: secretariat@photonics21.org

T: https://twitter.com/Photonics21

L: www.linkedin.com/company/photonics21