A technology for rapid detection of pathogenic bacteria in complex food matrices

Hugo Benchetrit¹; Christophe Chassard², Cécile Callon²; Mahfod Benessalah¹; Anne-Gaëlle Bourdat¹

¹CEA/DRT/LETI/DTBS/LSMB-Grenoble ² INRAE/Unité Mixte de recherches sur le fromage d'Aurillac

Detecting the presence of pathogenic bacteria is a major challenge for health and food industry, which needs to release safe product, reduce the associated costs of rejected products and protect its image. Current classical tests are much too long for manufacturers dealing with fresh and fermented food products since they are based on enrichment and culture methods that deliver results in 24 hours at the earliest.

Based on a collection of patents from the CEA, the DIRECT-ANALYSIS start-up was created and offer a technology for the rapid detection of pathogenic bacteria in complex food matrices. Detection could be achieved in less than 6 hours with a sensitivity in line with the AFNOR standard. Compared to current tests, the DIRECT solution allows the rapid localisation of the origin of a bacterial contamination. Manufacturers could ensure safe food production and limit associated-costs due to products recall or products destruction.



However, dairy matrix analyses directly in the field are still a challenge, and especially in Auvergne Rhône Alpes region

(AURA), where 5500 raw milk producers use raw milk to produce in 83 000 t raw milk cheese. 20 PDO (Protected Designation of Origin) cheeses are produced in AURA. This represent 43% of nationals PDO cheese and a huge economical contribution.

Each year, hundred cheese tonnes are discarded because pathogenic bacteria presence as *Listeria monocytogenes, Escherichia coli* STEC and *Salmonella* is detected too late.

AURA producers need a rapid, sensitive and simple test on the field to ensure safe milk and cheese production. Funded by AURA region, CEA, in partnership with INRAE, is working on adapted sample preparation from direct Analysis technology for diary matrices in the field. The aim is to concentrate bacteria and extract DNA, in a few minutes after milk milking. Extracted DNA is then analysed by molecular biology techniques.

Today, dairy sample preparation improvement in combination to DIRECT-ANALYSIS technology allow to detect *Salmonella enterica* and *Listeria monocytogenes* in less than 2 hours without sample enrichment.

Keywords : sample preparation, pathogenic bacteria, salmonella, listeria, milk, cheese

for bacteria DNA extraction