

New Test for The Rapid Detection of Counterfeit Cheese

Agroscope, in collaboration with SwissDeCode, an innovative new startup company, have been developing an easy-to-use test to verify the authenticity of Agroscope's bacterial cultures. The test is simple, fast and can be done on-site to get quick results.

Petra Lüdin¹, Gianpaolo Rando², Brij Sahi²



Image 1: Preparation of the samples, the reactions and the results can all be completed without the use of a laboratory infrastructure.

In the past few years, being CCO certified has been the primary weapon against black market counterfeiting for Swiss cheeses. The certification has been used successfully since 2011 with Emmentaler AOP, since 2013 with Tête de Moine AOP and since 2015 with Appenzeller®. These special bacterial strains were developed on behalf of the industry by Agroscope, the Confederation's leader in agriculture. They are composed of a specific strain of bacteria that is easily identifiable, which is added into the milk used to make cheese products by certain authorized manufacturers.

The bacteria can survive the manufacturing process, however, they do not produce any technological property and therefore, do not have any impact on the finished cheese product.

Agroscope has recorded this bacteria's genome and has now developed a test to detect the strain by using a polymerase chain reaction (PCR). This makes it possible to easily distinguish between an authentic Emmentaler AOP product and a counterfeit product, for example. Furthermore, this test can be used for any type of cheese product from shredded cheeses, to rosettes, to fondue.

An Hour, Instead of a Week

Since the first CCO products were introduced, Agroscope has analyzed nearly one thousand cheese samples to verify their authenticity. In the past, samples that were deemed suspicious were sent to Berner Liebfeld lab for analysis, which typically took somewhere between 1 to 2 weeks for a response. Recently, however, a better method has been developed which delivers faster results and does not require the use of equipment that would only be available in a laboratory environment.

This document is an English translation of the original article "Käse Fälschungen Sofort Aufgedeckt | Nouveau test rapide pour la détection des contrefaçons de fromages. *Alimenta*, (10), pp.20-21." in French and German. In case of any discrepancies, the wording of the original article applies.

In collaboration with SwissDeCode, Agroscope has now developed a mobile test kit that produces on-site results in less than one hour. Dubbed the «DNAFoil», the test is comprised of a small white-and-red box that houses a spot for the test samples, a small test tube for the reaction and a testing strip, somewhat like a pregnancy test (Image 1).

To test a sample, all that is required is a work surface and some hot water. Furthermore, the test no longer needs to be carried out by qualified lab personnel and only a few grams of cheese are needed to be able to detect the product's CCO authenticity.

The First In-Depth Tests

Prior to the collaboration with Agroscope, SwissDeCode had already begun developing the DNAFoil testing system. The young startup company from the Lausanne suburb of Renens (VD) had previously recognized the need for a mobile test system during the endless fight against counterfeit products in the dairy industry and had begun experimenting with similar genetic tests in 2016.

By the end of 2016, the company was awarded the “Mass Challenge Switzerland Gold Prize” and in 2017, the first genetic test kits for pork products was released. Later in the same year, SwissDeCode was also a finalist in a competition during the “Connecting Bright Innovations” conference held in Delft, Netherlands.

Agroscope was initially skeptical, questioning whether such a simple test was trustworthy and could function properly when testing cheese products with complex structures filled with salt and rich in fat. Due to the high demand for such a test, however, the company decided to move forward with an initial trial phase. With financial backing from Swiss Food Research, SwissDeCode then developed two bacterial test kits that were meticulously examined by Agroscope.

Positive Results Confirm Feasibility

The first prototypes required the samples to be kept on ice for DNA extraction and yielded successful results with positive identification of both strains of bacteria. The kits were subsequently perfected, and the second prototype were able to extract and identify both bacteria strains at room-temperature using one single test strip.

Following approximately 60 additional trials on cheeses with the bacteria, as well as negative control samples with different concentrations of CCO, the test's feasibility was successfully proven (Image 2).

With DNAFoil, the detection of the CCO strain is simple and requires minimal effort. Furthermore, it is just as sensitive as the traditional PCR method. The primary

difference is the speed with which the result is delivered directly in the field, without the need for laboratory equipment or environment. A secondary validation is not necessary. In addition, the cost of using the test is approximately 3 times less than traditional analysis methods.

The Next Step

Initial teething problems at the outset have now been overcome and SwissDeCode continues to pursue further improvements in detection before widespread product commercialization. This test has demonstrated successfully the feasibility of the SwissDeCode technology providing a new viable analysis method to fight against counterfeit cheese in the dairy industry. Whether the test is conducted by a customs officer, lab tech or a store front manager, the results are available directly on-site in very little time, so any potential issues can be dealt with immediately.

Agroscope must continue to prove the effectiveness of their test in the lab with the help of a qPCR for the test to be used as evidence that will stand up in court during legal proceedings.



Image 1: The top test strip shows a positive result where the two bacterial strains were successfully detected. The bottom test strip shows negative results where there was no bacterial strain detected whatsoever.

¹Agroscope, Schwarzenburgstrasse 161, 3003 Berne; www.agroscope.ch

²SwissDeCode, Chemin du Crêt, 1279 Chavannes de Bogis; www.swissdecode.com