

DNA test systems for the determination of food and animal feed quality

Simple and fast quality tests
for the detection of unwanted substances

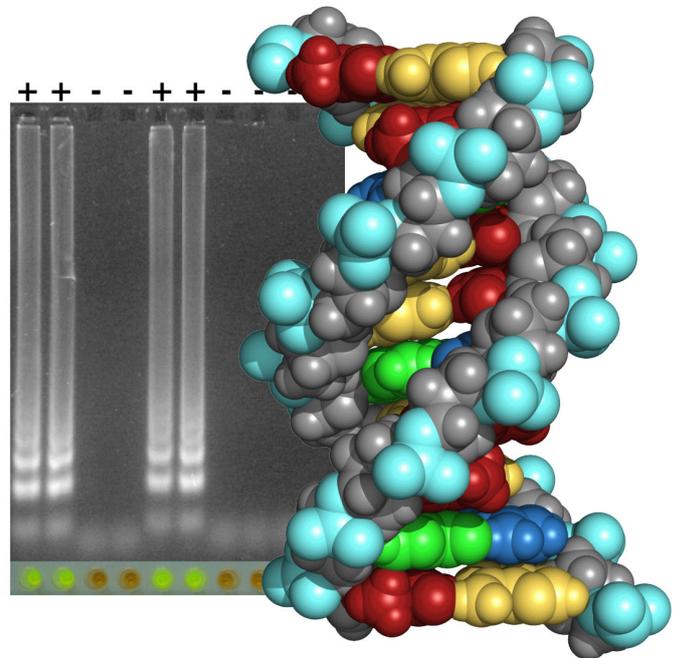
Numerous - mostly unwanted - components can negatively influence the quality of food and animal feed. Such substances are often toxic, allergenic or trigger safety concerns among consumers, as in the case of genetically modified maize or soya. All of these potentially unsafe ingredients cannot, however, be identified with the naked eye: instead, complex analysis processes must be used for reliable detection. Previously, reliable analyses were exclusively performed in well equipped laboratories and specially trained personnel were needed for the investigation and assessment of results.

Objective

TU Wien is working on alternative approaches to the investigation of food and animal feed. The essential idea behind the new developments is to enable investigations to be carried out on location and independent of chemical laboratories. The key focus of the developments is on simple analysis. Expensive laboratory equipment is also not required for this and, ideally, no specialised equipment will be needed at all. In addition, the interpretation of the results obtained and the assessment of their practical relevance should be simplified. Often, a clear yes/no conclusion in a short time and at a low cost is more helpful than a complex analysis in a laboratory with results that are difficult to interpret.

Approach

In order to meet these requirements, all of TU Wien's tests use a unique molecule: DNA. DNA is always the key to the detection, although it is also dependent on the substance being analysed in a different form. In general, the DNA finds its target in the test process

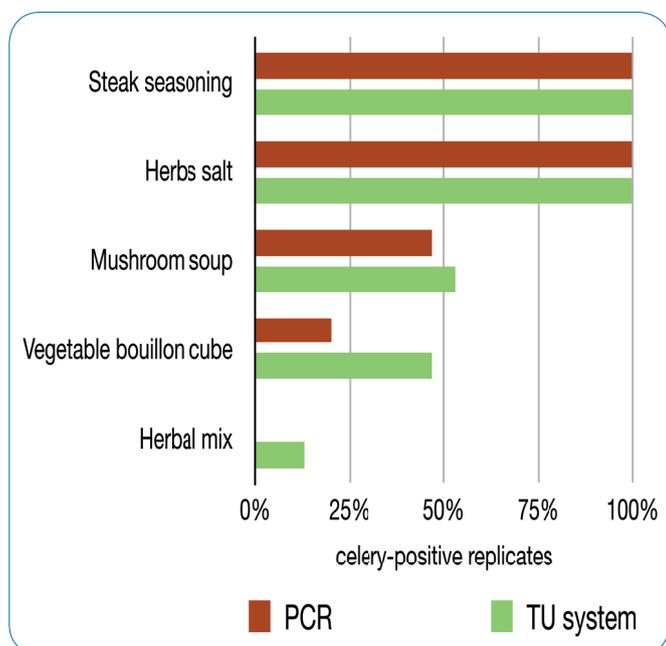


A quick look - Testing substance shines at positive tests (green - in the background)

and binds to the target substance. Two different technologies are used here: mycotoxins, on the one hand, are bound using what are known as aptamers which render them visible. Aptamers are short DNA fragments which form a very special 3D structure and can thus attach perfectly to their target. These aptamers are being developed in the aptamer evolution platform at TU Wien. On the other hand, other larger unwanted components such as food allergens or genetically modified organisms can be detected by selective reproduction of their own DNA. Regardless of whether extremely small molecules such as toxins or traces of unwanted plants or moulds are to be detected, the processes are always fast and reliable.

Results

In contrast to standard laboratory methods, no expensive instruments are required for the DNA process; the analysis is performed instead by means of isothermal amplification using basic heating elements. All these detections can be completed within one hour or less by trained lay people.



Today's test standard PCR (brown) vs. the highly sensitive quick test of TU Wien (green) - example: food allergen celery

The fast tests developed so far include aflatoxin, one of the world's most important mycotoxins, the food allergen celery and genetically modified maize, soya and rapeseed varieties. Investigations into food samples from supermarkets have shown that even extremely small traces of unwanted constituents can be detected using these tests and, additionally, an analysis time of less than one hour can be achieved. The fast tests which have been developed so far have been compared in comprehensive studies to complex laboratory methods, yielding results which are identical in each case.

Fields of application

The tests can be used in all areas of food manufacturing, starting with production in the field, through to quality control of industrially processed products.

The test systems are not restricted to the detection of the abovementioned substances, and can be adapted at very little cost for completely new requirements, for example control of food authenticity: for example differentiation between cheap and high-quality fish, basmati and standard rice or different types of coffee.

Benefits

TU Wien provides users with a test simple to handle - without the need to use an expensively equipped laboratory. The innovative tests enable fast analysis of an extremely wide range of food ingredients in a short time (in just 1/10 of time required up to now). Detection with the greatest possible level of sensitivity. First DNA-fast test for detection of food allergens proven in use.

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