

# Food scientists: We can detect much more food fraud

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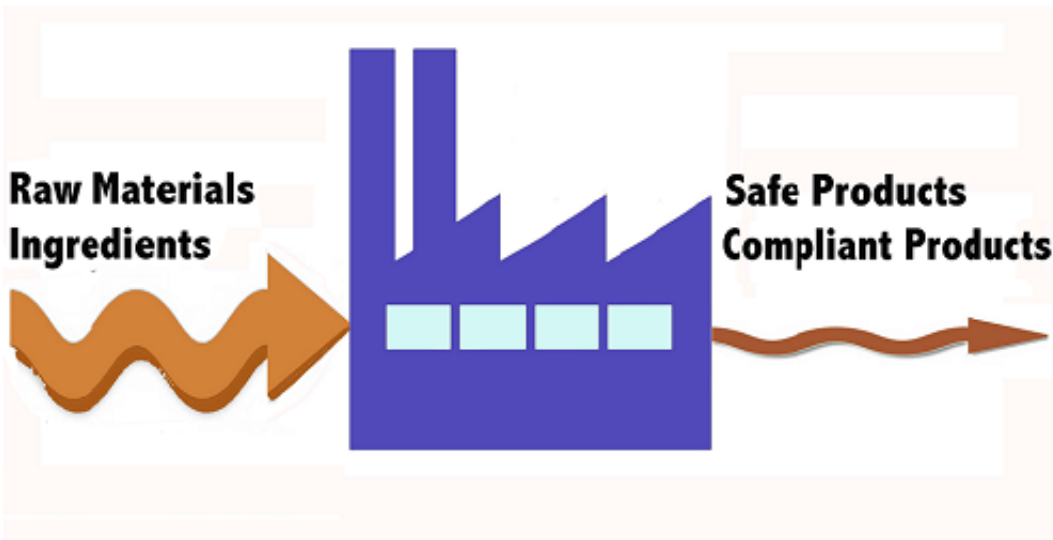


To the right is gum arabic of a high quality in the form of "tears" from the acacia tree *Acacia senegal*, which has been difficult to obtain at times because of conflicts in the growing areas. To the left is gum arabic of a much lower and more impure quality from the tree *Acacia seyal*. Gum arabic is used in Ga-Jol, where it provides the unique chewing and flavor release sensation. Credit: Lene H. Koss.

Researchers from University of Copenhagen have reviewed the use of NIR spectroscopy to detect food fraud in a special issue of the scientific journal *Current Opinion in Food Science*, which reports on food science innovation.

"The problem is that the food analyses which are predominantly used today are only spot checks and they are typically targeted towards a single kind of food fraud. We would like to move away with this old-school methodology and instead take a "non-targeted" physicochemical fingerprint of the foodstuffs. By using fingerprints and contrasts we can determine whether a given batch of raw materials or ingredients are defective or different compared to the usual," says co-author of the article Professor Soren Balling Engelsen from the Department of Food Science (FOOD), at University of Copenhagen, Denmark.

The article mentions the case from 2008, where Chinese manufacturers added melamine to milk powder for [infant formula](#), causing 300,000 children to fall ill and 6 deaths. Melamine is a synthetic substance with 66% nitrogen and it was added to the milk powder to make customers believe that it contained more protein than was actually the case and thus had a higher value. The fraud succeeded tragically, because "protein content" was checked using the old Kjeldahl method - a method of analysis that measures the total nitrogen content in the food, which is then equated with the protein content. In this case, the detected substance was not protein, but the hazardous to your health melamine nitrogen.



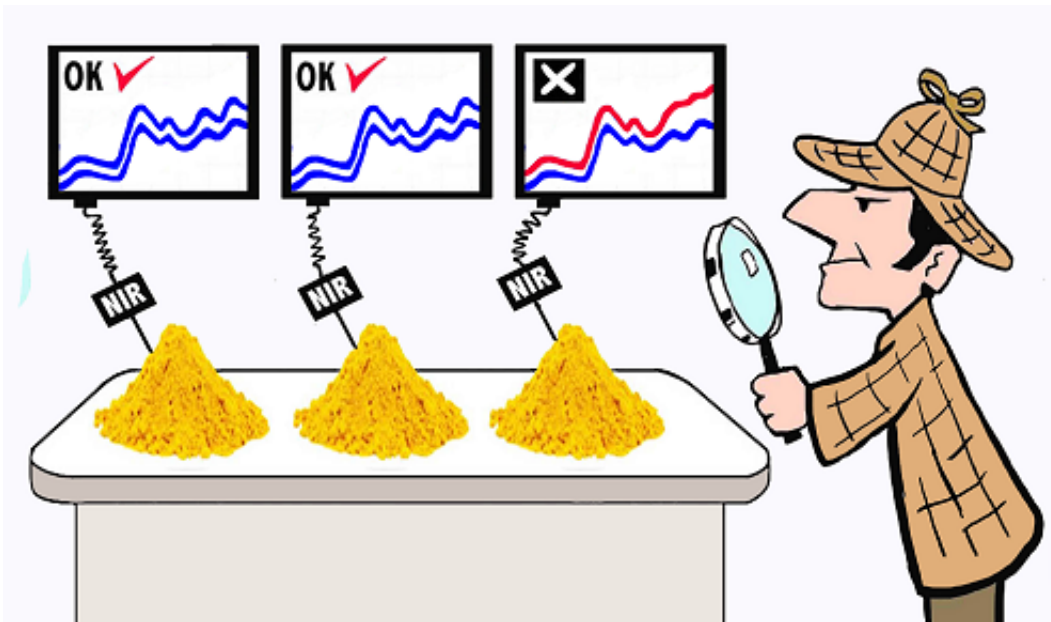
With spectroscopic monitoring it is possible to examine all of the ingredients and raw materials that goes into the production and at the same time optimise its consumption of raw materials and to achieve a consistent, environmentally and safe production. Credit: Sørensen et al.

"Now there is probably no longer anyone who would think about putting melamine in milk powder. An alternative nitrogen-rich substance could be Urea, or in popular terms "piss in the powder", where nitrogen rich urea is used to fool the Kjeldahl analysis - but not NIR spectroscopy," says Soren Balling Engelsen.

## **NIR spectroscopy is already used, but not enough**

Another advantage of NIR spectroscopy is that you can examine large quantities of raw materials or ingredients. With spectroscopic monitoring it is possible to examine close to 100% of the ingredients and raw materials that goes into the production, thereby considerably reducing production errors or productions that are of a lower quality than the recipe dictates. At the same time, the company can use the method to optimise its consumption of raw materials and to achieve a consistent,

environmentally and safe production.



Much more food fraud could be detected by using Near-infrared spectroscopy says researchers from the Department of Food Science at University of Copenhagen. Credit: Sørensen et al.

A good example of a food ingredient that can be manipulated by the suppliers is the desirable gum arabic (E414), which has some valuable properties as a stabiliser, chewing properties and flavour release. Gum arabic is found in Ga-Jol, for example.

"However, it is easy to adulterate food with gum arabic, when it appears in the form of freeze-dried powder, which many suppliers have gradually started to sell. Previously, it was found most often in the form of "tears" from the acacia tree - that is, as large amber-like clumps that cannot be easily forged. But it has been difficult to obtain high quality gum arabic because of the war and unrest in the growing areas (South

Sudan). As a powder, it is easy to falsify the gum arabic by mixing an inferior quality with the good and sell it all as being of a high quality. This kind of fraud can also be detected by NIR spectroscopy," says Soren Balling Engelsen.

The methods are already being used in parts of the food industry, but according to the researchers it is far from being widespread enough.

"We have known and developed these methods for 20 years and they have become better and cheaper over time. The use of NIR spectroscopy to monitor food quality was already endorsed in the 1970s when Canada began to replace the chemical requiring and cumbersome Kjeldahl analysis with NIR spectroscopy to analyse their cereals for the protein content. For this purpose, NIR spectroscopy is exclusively used as a targeted method i.e. for measuring protein content. But when you want to detect [food fraud](#) and food adulteration, you are not looking for a single substance, but have to look broadly. An increased use of NIR spectroscopy will definitely be able to save us from many forms of food modification that could be of more or less serious kinds - from receiving lower quality products to becoming seriously ill," says Soren Balling Engelsen.

**More information:** Klavs Martin Sørensen et al, The use of rapid spectroscopic screening methods to detect adulteration of food raw materials and ingredients, *Current Opinion in Food Science* (2016). [DOI: 10.1016/j.cofs.2016.08.001](https://doi.org/10.1016/j.cofs.2016.08.001)

Provided by University of Copenhagen

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