No biomarkers identified to assess potential health effects of GMOs

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Credit: Joseph Hill

Many people in Europe are critical of genetically modified (GM) food, due to safety concerns. A Eurobarometer survey, published in 2010, revealed that the European public tends to be worried on a "mediate level" about GM food, with people in Austria being particularly concerned. Today, genetically modified maize is cultivated commercially, mainly in Spain and Portugal. Nonetheless, authorised GM Organisms (GMO) may enter the European market as feed for animals or in food products.

Whether such products pose any health threats to consumers, is

controversial. "We have to find the best way to evaluate the issue," says Michelle Epstein, an allergy and immunology clinician from the Medical University of Vienna, Austria. She coordinated a recently completed EU-funded project called GMSAFOOD that aimed at identifying possible biomarkers for indicating adverse health effects of GM food. Such biomarkers could be used for monitoring commercially available GM food or feed.

The European Food Safety Authority EFSA, who plays a fundamental role in assessing the risk of GM crops and derived food and feed in Europe, has included a recommendation for so-called post-market monitoring (PMM) in its Guidance for risk assessment of food and feed from genetically modified plants, published in 2011. This approach is supposed to complement the pre-market toxicological tests. "This [the PMM] is for the unexpected things", Epstein explains. "Even if you do a lot of testing before placing a product on the market, it is not the public at large you are testing," she tells youris.com. Some people may have immune diseases or consume certain products at very high levels.

As part of the project, the researchers conducted feeding experiments with pigs, mice, salmon and rats. They fed them with a variety of commercially available GM maize, called MON 810, and a pea containing a pest resistance gene derived from a bean. "We were using the peas because we knew it had effects", Epstein says. Indeed, a previous study published in 2005 by Australian scientists had shown allergenic responses in mice feeding on the pea.

However, the researchers were not successful in their search for biomarkers. "We didn't see any health effects", Epstein comments. Moreover, when looking at the allergenic effect the peas had caused in the original study, the scientists found the same effects in the native bean, implying that the GM pea did not cause the allergic reaction. They attributed this discrepancy to a cross-reaction with a substance called pea

lectin and to technical differences between testing laboratories.

The project scientists also developed a machine learning approach to identify potential GMO-associated biomarkers. Data is fed into a mathematical model, which is supposed to find parameters that may serve as biomarkers. "We proposed to the [European Commission] to set up a public repository with all of the project data," Epstein says. This public database would also allow people from research and industry to include their own data and use the approach for identifying biomarkers for PMM.

Experts doubt the usefulness of PMM, in this case. "In my view, in contrast to the mandatory post-market environmental monitoring, monitoring GM food is questionable," comments Joachim Schiemann, biosafety expert at the Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Germany. He considers the pre-market risk assessment of GM food as sufficient in most cases. He argues that uncertainties should be defined prior to introducing a product to the market. "The regulatory authorities have to decide how much uncertainty is acceptable," Schiemann adds.

Other experts agree. "I am personally very reluctant to consider PMM as a useful tool for risk management of GM food or feed," Harry Kuiper, retired scientist at Wageningen University, the Netherlands, and former head of the GMO Panel at EFSA, says. He points at various difficulties PMM may face. For example, he believes that it is hard to determine which group to target and how much of a product people actually consume.

"For the GM foods on the market today, there are simply no indications for identification of biomarkers upon exposure of humans or animals," Kuiper also tells youris.com. "Personally, I would try to solve problems or uncertainties identified with GM food or feed during the pre-market

risk assessment", he adds. However, he believes that future GM food, which may alter the physiological or nutritional status of humans or animals, may provide opportunities for identifying biomarkers.

While she is not opposed to post-market monitoring, Helen Wallace, director of the not-for-profit organisation Genewatch UK recognises that "it is a very hard thing to do". Instead, "we need more pre-market assessments of GM crops", Wallace says. In her view, these should include follow-ups of studies, which suggest possible adverse health effects. She also criticises prevalent study designs and the fact that regulators have to rely on commercial studies: "These lack independence and often data isn't made public by companies."

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