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## Genetically engineered maize: New indication of health risks

Bt protein toxic to human cells

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Caen/ Munich

Insecticidal Bt toxins such as those produced in genetically engineered plants can be detrimental to human cells. This is a result of recent research led by researchers at the University of Caen (France). Their experiments showed that toxins produced in, for example, the genetically engineered maize MON810, can significantly impact the viability of human cells. The effects were observed with relatively high concentrations of the toxins, nevertheless there is cause for concern. For the first time, experiments have now shown that they can have a toxic effect to human cells. According to companies like Monsanto, which produces genetically engineered maize with these toxins, the toxins are supposed to be active only against particular insects and should have no effect on mammals and humans at all. The investigation of effects of Bt toxins on human cells is not a requirement for risk assessment in Europe or in any other region

Another finding of the researchers concerns a herbicide formulation sold under the brand name Roundup. Massive amounts of this herbicide are sprayed on genetically engineered soybean crops and its residues can be found in food and feed. According to the new publication, even extremely low dosages of Roundup (glyphosate formulations) can damage human cells. These findings are in accordance with several other investigations highlighting unexpected health risks associated with glyphosate preparations.

"We were very much surprised by our findings. Until now, it has been thought almost impossible for Bt proteins to be toxic to human cells. Now further investigations have to be conducted to find out how these toxins impact the cells and if combinatorial effects with other compounds in the food and feed chain have to be taken into account," says Gilles-Eric S  ralini from the University of Caen, who supervised the experiments. "In conclusion, these experiments show that the risks of Bt toxins and of Roundup have been underestimated."

Bt toxins and tolerance to herbicides are broadly used in genetically engineered plants. Bt proteins only naturally occur in soil bacteria. By introducing the modified toxin gene into the plants, the structure of the toxins is modified and may thereby cause selectivity to be changed. The content of the proteins within the plants is highly variable. Many genetically engineered plants contain several Bt toxins at the same time. For example, SmartStax produces six different Bt toxins and therefore has a higher overall content of the proteins. In addition, it was made tolerant to herbicides. So far, there has been no investigation of the combinatorial effects of these toxins and residues from spraying, or their potential risks for human health, which was considered unlikely. The researchers have now shown that interactivity does occur. Under the specific conditions of their experiment, the Bt toxin lowered the toxicity of Roundup. Further investigations are necessary to examine other potential combinatorial effects under varying conditions.

"These results are pretty worrying. Risk assessment requirements for genetically engineered plants and pesticides need to be rigidly enforced. In the light of these findings, we think that the commercialisation of these plants is not in accordance with EU regulations", says Christoph Then at Testbiotech. Testbiotech is closely following risk assessment at the European Food Safety Authority EFSA and has repeatedly brought attention to gaps in risk assessment.

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Mesn  ge R., Clair E., Gress S., Then C., Sz  k  cs A., S  ralini G.-E., 2012, Cytotoxicity on human cells of Cry1Ab and Cry1Ac Bt insecticidal toxins alone or with a glyphosate-based herbicide, Journal of

Applied Toxicology, <http://onlinelibrary.wiley.com/doi/10.1002/jat.2712/abstract> [1]

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