GREENPEACE

GE potato with altered starch – EFSA's opinion gives no assurances of food, feed or environmental safety.

EFSA's opinion[1] of the suitability of GE potato with altered starch composition is woefully inadequate. A positive opinion of this GE crop does not protect wildlife, consumers or livestock. There are many irregularities that could have implications for food safety should these GE potatoes contaminate the human food supply. However, once again, EFSA simply dismisses these irregularities with phrase such as "unlikely to cause adverse health effects. The only assurances this opinion gives, is that EFSA is not protecting consumers, livestock, or the environment.

1) **GE potatoes cannot be kept separate from food potatoes so the implications of irregularities in the molecular, compositional and toxicological data for human food safety need to be taken very seriously indeed.**
2) **The molecular data demonstrates that it is entirely possible this GE potato could produce new proteins, or alter existing plant proteins. These unintended or altered proteins would have implications for human food safety if the potatoes became mixed with those intended for human consumption.**
3) **Compositional data shows unexpected changes in potato chemistry. Alterations of the levels of normal plant toxins are to be expected. If the levels of these toxins increase, there could be dangers to human and animal health.**
4) **Significant differences found in toxicological studies should be fully investigated to see if they are of importance to human and animal health.**
5) **The ecological implications of cultivation of this GE potato remain unknown. Effects on biodiversity have not been considered.**
6) **Antibiotic resistance is unacceptable.**

1) GE potatoes cannot be kept separate from food potatoes

These GE potatoes cannot be kept completely separate from potatoes from food, even given the identity preservation system. Anyone who has ever grown potatoes knows that there are always volunteers the following year. These volunteers can produce tubers, which could end up for human consumption. The recent experiences with GE contamination of rice, both in the USA and China, show us that GE crops cannot be controlled.

The potential contamination of the human food supply means that the implications of irregularities in the molecular, compositional and toxicological data for human food safety need to be taken very seriously indeed.

2) Molecular data

The molecular data contains numerous irregularities, including several additional unintended fragments. These fragments make the probability of unexpected and unpredictable effects even more likely. The most serious effect of these fragments is that they create an open reading frame (ORF). This means the DNA can be "read" (or transcribed), i.e. it could be active. And indeed, it is. ORF4 is transcribed to the RNA level. This is one step away from producing an unintended protein.

Instead of this raising the alarm on this GE potato, EFSA state

"Extensive studies indicated that, although ORF4 transcript is detectable in the GM potato, there is no corresponding translation into a protein, confirming expectations from the molecular characterisation of ORF4."

But this is a gross oversimplification. The protein could be produced if conditions change within the potato (e.g. under environmental stress such as drought). Or, the ORF could interfere with the plant's own metabolism, affecting the production and composition of plant proteins.

Therefore, it is entirely possible that this GE potato could produce new proteins, or alter existing plant proteins. These unintended or altered proteins would have implications for human food safety if the potatoes became mixed with those intended for human consumption.

3) Unexpected effects

This GE potato alters a metabolic pathway, that of starch production. Therefore, any changes in metabolism must be treated as potentially adverse effects. These changes are apparent in changes in compositional analysis. Of particular relevance are the unintended changes in sugar content as these are likely to be directly related to the intended changes in starch metabolism. The compositional analysis reveals several unexpected alterations in the potato metabolism:

As EFSA state "*In addition to the intended alterations in starch composition of the GM potato, some statistically significant differences between the GM potato and its control were observed each year, including a decrease in yield and dry matter and an increase in sucrose content…and vitamin C content…. Other differences were also noted during single years, but not consistently throughout the three years, such as decreases in glycoalkaloid levels of solanine and chaconine in potato EH92-527-1 during two years.*"

Unexpected effects are of utmost importance in potatoes as they have a very complex secondary chemistry, including the production of toxic compounds. The genetic engineering of potatoes is well documented to give rise to unexpected effects[2,3,4].

Experimental GE potatoes to alter carbohydrate levels (in this case sugar rather than starch) found unexpected changes in the levels of toxic compounds in potatoes when they were exposed to stresses such as disease or drought. The authors of the study concluded: "*It is clear that genetic manipulation of carbohydrate metabolism and pathogen resistance often leads to changes in the profile of plant defense compounds* [i.e. toxins] *present in the organs of potato plants including the tubers… At the present time, the mechanisms behind the changes observed in this study are not clear but may include direct effects due to changes in the hexose pool and/or indirect effects due to changes in the susceptibility of the plants to infection and infestation."* [4]

Despite this, EFSA simply state

"The GMO Panel concludes that the observed differences are unlikely to cause adverse health effects."

If the fruit juice and fruit water and/or pulp are to be spread on fields, soil, livestock and wild organisms will be exposed to the GE potato. However, even though significant differences have been found with the chemical composition of GE potatoes, their potential is disregarded. No studies have been conduced biogeochemical processes, e.g. soil carbon and nitrogen turnover, although any change in microbial ecology could affect soil fertility and be important.

There are no assurances of human food safety should these potatoes become mixed with conventional potatoes. Nor are there any assurances for animal feed safety, nor safety for the by-products to be spread on the fields. Alterations of the levels of normal plant toxins are to

be expected. If the levels of these toxins increase, there could be dangers to animal and human health.

4) Toxicity

In animal feeding trials, significant differences were noted but disregarded by EFSA:

"In female animals, statistically significant differences in white blood cells and spleen weight were noted between animals that were fed the transgenic potato and those given a diet containing the parental cultivar. However, these differences fell within the range of values observed in animals fed the standard rodent laboratory diet. Moreover, these changes were not accompanied by any changes in other lymphoid organs besides the spleen."

These significant differences should have been fully investigated to see if they are of importance to human and animal health.

5) Effects on biodiversity have not been considered

The list of insects, bacteria and fungi that interact with potatoes in Europe is extremely long. It is likely that potato cultivation plays a role in European agro-ecology. However, there is no systematic analysis of the possible risks to biodiversity from this GE potato. In particular, long terms sub chronic effects and effects at different trophic levels should be considered. The changes in metabolism make it likely that would be changes in the interaction of insect-potatoes and this could have effects up eh food chain.

However, EFSA disregard this important impact of cultivation of the potato. EFSA simply state that "*The results of field studies suggest neither greater susceptibility nor greater resistance to pests …and diseases … than non-GM potato lines.*"

This assessment is from an agronomic rather than biodiversity perspective. This is unacceptable. EFSA do not even make possible adverse effects on biodiversity (for example, by selecting key indicator insect species) the subject of case-specific monitoring.

The ecological implications of cultivation of this GE potato remain unknown.

6) Antibiotic resistance

The GE potato contains an *npt*II gene for resistance to the antibiotic, kanamycin. This has potential to transfer from plant material to microbes in the soil, during cultivation or afterwards as potato juice is to be used as a fertilizer. Gene transfer would increase bacterial resistance to this antibiotic, reducing the effectiveness of this antibiotic.

EFSA simply state consider *"any additional contribution from potential transfer to soil microbes is considered to be insignificant."*

Antibiotic resistance is unacceptable.

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[1] Opinion of the Scientific Panel on Genetically Modified Organisms on a request from the Commission related to the notification (Reference C/SE/96/3501) for the placing on the market of genetically modified potato EH92-527-1 with altered starch composition, for cultivation and production of starch, under Part C of Directive 2001/18/EC from BASF Plant Science (Question No EFSA-Q-2005-023). The EFSA Journal (2006) 323: 1-20

[2] Birch, A.N.E., Geoghegan, I.E., Griffiths, D.W. & McNicol, J.W. (2002) The effect of genetic transformations for pest resistance on foliar solanidine-based glycoalkaloids of potato (*Solanum tuberosum*). Annals of Applied Biology, 140, 143-149.

[3] Kuiper, H.A., Kleter, G.A., Noteborn, H.P.J.M. & Kok, E.J. (2001) Assessment of the food safety issues related to genetically modified foods. The Plant Journal, 27, 503-528.

[4] Matthews, D., Jones, H., Gans, P., Coates, S. & Smith, L.M. J. 2005. Toxic secondary metabolite production in genetically modified potatoes in response to stress. Journal of Agricultural and Food Chemistry 53: 7766-7776.