



Rats and potatoes: toxicity studies and GM foods

The safety of genetically modified (GM) foods came under the spotlight in 1998 after a scientist, Dr Arpad Pusztai, published research findings involving his laboratory experiments with GM potatoes and rats. This issue paper outlines the results and investigates the findings and claims made by Dr Pusztai.

One of the greatest public fears with GM foods centres on how safe they are to eat. There have been many claims made by a variety of people on this topic. One of the most publicised opinions was that of Dr Pusztai, a scientist working in Scotland.

On 10 August 1998, Dr Pusztai of the Rowett Research Institute in Aberdeen, Scotland appeared on British television questioning the safety of GM foods. Dr Pusztai revealed his results prior to submitting them to the peer review process which tests the validity of the experiment based on all the previous scientific evidence and knowledge in the particular area. Dr Pusztai's concerns centred on the adequacy of testing of these foods.

Dr Pusztai's concerns were based on the results of experiments he had run that involved feeding GM potatoes to rats in a laboratory.

The experiments appeared to indicate that rats fed GM potatoes had lowered immune systems and smaller organs than normal rats. These findings suggested that procedures used in gene technology could make plants harmful. Based on this, Dr Pusztai claimed GM foods could have dangers that were not adequately revealed by testing.

Genetically modified potatoes of the type used by Dr Pusztai are not being produced for human consumption. They were produced for experimental purposes only. Proteins he used in these experiments are known to cause problems with immune systems in animals and humans.

Independent reviews of Dr Pusztai's experiments, by four separate groups, raised serious doubts about the conclusions reached. These reviews also found no reason to doubt the safety of GM food testing.

The experiments

Dr Pusztai's experiments aimed to find out if a type of protein, known as a lectin, was harmful to laboratory rats. At that time, lectins were being investigated as a means of introducing pest resistance in crops.

Three groups of rats were used in the experiments.

Each group ate a different diet of potatoes:

- one group ate non-GM potatoes laced with lectins — the protein found in plants
- another group ate potatoes genetically modified to produce their own lectin (from two separate crops according to Dr Pusztai)
- the third group, the control group, ate non-GM (conventional) potatoes.

Dr Pusztai claimed his results showed that:

- The rats eating the GM potatoes had smaller livers and brains, larger spleens and had suppressed immune systems
- The rats eating non-GM potatoes and those laced with lectin showed no such side-effects.

The Pustzai conclusions

The conclusions drawn by Dr Pustzai and supporters were that the lectin itself did not cause the problems. Therefore, they claimed something else in the GM potatoes must have harmed the rats.

Indeed, the potatoes used in the experiments have been shown to be chemically different from non-GM (traditional) potatoes. This difference has nothing to do with the insertion of a new gene.

Potatoes are very prone to changes in known toxins when they are grown in experimental situations. The experiments did not take this into account, that is, they were not controlled for this variability.

This is not as alarming as it may seem as all new conventional and GM food products are extensively tested before they are approved for the marketplace. In fact one scientist stated, 'This study is more informative about working with potatoes than it is about GM technology.'

Further work on the same animals, by scientists at Aberdeen Medical School, claimed to have shown damage to the rat's livers and intestines. This revealed that the rats had been infected with a virus. As a result, it was concluded that the switch that turned on the inserted gene had triggered a viral infection in the rats. Again, the lack of controls make this conclusion invalid.

When a gene from one plant is placed in another plant it will remain dormant unless it is activated, or turned on. To do this, the 'on switch' is needed. This 'on switch' activates only the gene that it is linked to. The question is: 'Did the 'on switch' activate a virus in the rats?'

The switch chosen by Dr Pustzai is very effective in activating the inserted protein gene. However, the switch can only work to produce lectin. According to Dr Pustzai this switch did not activate any viruses in the potatoes.

Independent reviews of Dr Pusztai's experiment

Given the controversy raised by Dr Pusztai's comments when he appeared on British television, the experiments were reviewed by four separate, independent bodies — the Royal Society, the House of Commons Science and Technology Committee, the Nuffield Council on Bioethics and the Donaldson/ May Report.

Each group raised serious doubts about Dr Pusztai's conclusions due to the lack of proper controls and they found no reason to question the safety of GM foods based on his findings.

In addition, Dr Pusztai's own research institute has questioned the validity of the results. According to the Director of the Rowett Institute, Phillip James, the potatoes came from one crop not two as claimed by Dr Pusztai.

The same Director has outlined the experiments that were undertaken. One was performed over a 10-day period and showed a stimulated rather than a depressed immune system. It was not possible to make conclusions from the other 10-day experiment due to the variable nature of the results.

All scientific experiments are reviewed by other scientists prior to their publication. This allows independent assessment of the methods used and ensures an experiment is considered valid before its results are released. Dr Pusztai released his results to the media without any review and prior to any publication.

One of the experiments has now been published in the journal, *The Lancet*, despite some referees' recommendations not to publish it. It does not allow any conclusions about the effect of gene technology and according to one referee, 'The only thing they have shown is that rats fed raw potatoes do not do very well'.

Further information

'Inquiry report A338 — Food derived from glyphosate-tolerant soybeans.' (2000). Food Standards Australia New Zealand www.foodstandards.gov.au/_srcfiles/A338%20Inquiry%20report.pdf

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