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# **Report on a List of Abstracts On GM Crop Safety**

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## Summary

A list of 60 abstracts has appeared on a pro-GM website and is being used by supporters of GM crops as evidence that GM crops are safe to eat. A review of these abstracts found that most were animal production studies rather than studies applicable to human health. In fact, only nine abstracts could be considered to contain measures applicable to human health. The majority of these (6 abstracts; 67%) found adverse effects from eating GM crops. The list of abstracts therefore does not support claims that GM crops are safe to eat. On the contrary, it provides evidence that GM crops may be harmful to health.

## Introduction

The Institute of Health and Environmental Research Inc. (IHER) is a not-for-profit research institute with an interest in genetically modified (GM) organisms, particularly those destined for food. Its directors hold the following degrees: ordinary degrees in Medicine, Science and Agriculture, Honours Degrees in Agricultural Science and Organic Chemistry, a Master of Public Health, and PhDs in Plant Genetics and Medicine. The Directors have training and expertise in plant science, agriculture, medicine, chemistry, biochemistry, nutrition, epidemiology and biostatistics.

## Background

The list of abstracts was given to the Honourable Kim Chance MLC, Minister for Agriculture and Food; Forestry; The Midwest and Wheatbelt, Leader of the Government in the Legislative Council, Government of Western Australia (WA), by an agronomist as evidence of the safety of GM crops as food. The agronomist also gave the abstracts to Dr Judy Carman of IHER. Minister Chance asked Dr Carman to review the abstracts and to report on the evidence contained in them. This document constitutes the report.

The list of abstracts originated on the AgBioWorld website. This website also contains a petition in support of GM crops, which it urges people to sign. Hence it could be regarded as a pro-GM website. The list of abstracts is called “General Safety and Safety Assessment of Specific Genetically Modified Crops from Scientific Journal Articles”, and further into the website, “GM Animal Feed Safety Papers (abstracts)”. It was compiled by Wayne Parrot in October 2005. The website makes no claims about what these abstracts are supposed to show except for the two titles. That is, it is clear that the abstracts are supposed to show that GM crops are safe to eat. This is clearly the way that they are being used by the agronomist who gave the abstracts to the Hon. Kim Chance and to IHER. Written comments from him, by email, have included:

- “I have a list of GM studies which I gave to Kim Chance last year. These studies have tested the safety of GM for feeding to animals. Many of the studies are of a reasonable length of time and many have been done with anatomical biopsy's [sic] and many are conducted through Universities and respected independent establishments. See attached.”
- When writing about safety studies done on GM crops: “...the significant literature from many credible scientific institutions and individuals with distinguished track records in animal feeding studies that I sent to you.”
- “...why [do] you believe that the GM study for which you have secured \$92,000 of WA taxpayers money (some of which is mine) will show what these other GM studies did not.”

The agronomist also frequently asserted the independence of these studies.

It should be noted that the WA government is funding IHER to conduct animal feeding studies that are designed to measure the effect of GM crops on human health, using animal models and health outcomes suitable for human health, rather than animal production. Historically, animal feeding studies have almost always determined whether a GM crop can cause a detriment to animal production outcomes, such as the amount of milk a cow can produce or the efficiency of turning a GM crop into meat (eg the quantity of breast meat on a chicken). These are not measures that are used in medical research, simply because they are not suitable measures of human health. Of course, if adverse effects are found in IHER's animal studies, they may also have broader implications for animal husbandry. This lack of research into human health outcomes is one of the major reasons the WA government funded IHER to undertake studies. Consumer resistance to GM crops is based on consumer concerns about their health if they eat these crops. Such consumer resistance had led to concerns by farmers and the WA government about market rejection of crops grown in WA if GM crops are grown in that state. Hence the WA government has placed a moratorium on the growth of GM crops in the state. Consumer concerns can only be allayed by demonstrating the safety of GM crops to consumers' satisfaction. This will require long-term animal feeding studies measuring outcomes relevant to human health undertaken by independent researchers. Some members of the public may also require human feeding studies.

The aim of this review is therefore to determine whether the list of abstracts show whether GM crops are safe for human consumption.

## Review

The review was conducted in four steps. Abstracts failing one step did not progress to the next. As each abstract needed to pass all steps, this approach provided a time-efficient means of culling unsuitable abstracts. There were 60 individual entries on the abstract list. However, one was not an abstract but an erratum, where the authors simply corrected errors in a table in a previously-written paper. Hence this was removed from the list, resulting in 59 actual abstracts.

### **Step 1. Was the paper published in a peer-reviewed scientific journal?**

When considering scientific evidence, scientists view research that appears in peer-reviewed scientific journals as being of a higher standard than those that get published in other forms, generally because the quality of work has been properly reviewed in the former and not in the latter. Hence only papers in peer-reviewed scientific journals should be considered here. As abstracts rather than whole papers were provided, it was difficult to determine whether an abstract had come from a peer-reviewed scientific journal or not. However, there were four that were clearly from the "grey" literature. These were reports rather than scientific peer-reviewed papers. One of these abstracts was written entirely in German, but a translation of the "journal" title indicated that it was a technical periodical rather than a peer-reviewed scientific journal. All other abstracts were given "the benefit of the doubt" and passed this step.

### **Step 2. Are the studies relevant to human health?**

Of the 55 abstracts that entered this step, 46 failed this step, being 78% of the original 59 references and 84% of the abstracts that entered this step. Most failed because they were animal production studies, ie they used diets or measured outcomes that were not applicable to humans. Examples include:

- The effects of eating GM silage when humans do not eat silage.
- Diets were altered using ingredients that are not permissible in human diets eg sand and ground cardboard.
- Animal production outcomes were measured such as milk production, feed conversion to various types of carcass weight and even “sticky droppings”.
- Animals with completely different physiologies to humans were used as experimental animals. For example, chickens were often used when they are clearly not comparable to humans – they have feathers, fly, lay eggs, do not suckle their young, have nucleated red blood cells, caeca, air sacks instead of lungs, kidneys that do not produce urine, two “stomachs”, and swallow grit and pebbles to help grind their food – all of which would be considered highly unusual in a human. Studies on fish are even less comparable. Cows are also not comparable because, while they are at least mammals compared to many other animal models used in these studies, amongst other things, they have several stomachs, chew their cud, and can digest cellulose. Hence they can thrive on a diet that would kill a human; such as one consisting entirely of grass. Pigs are physiologically closer to humans and can be used in feeding studies designed to test human end points but in practice are rarely used due to their size. That is, they cost more to house and feed.

Other abstracts failed because they were not animal feeding studies at all, but measurements done *in vitro* or on soil or plants. Examples of the latter include comparisons of the composition of a GM crop to a non-GM crop and measurements of the amount of transgenic protein expressed in a GM plant.

Some studies looked at whether GM DNA could survive digestion and enter the animal’s tissues, with some showing that it did and others that it did not. While the difference could be attributed to different digestion rates of different types of GM DNA, the studies also showed similar inconsistent results for non-GM DNA, indicating a problem with various detection methods in different hands. However, all but one were rejected as measures of human health because they used an animal model that was not comparable to humans (eg cows or chickens) or the outcome measured was not suitable for humans. Notably, a fairly famous study by Netherwood et al on humans, showing that GM DNA could be taken up by bacteria in the human gut, was not included in these abstracts.

Nine abstracts remained after this step, being 15% of the original abstracts in the abstract list and 16% of the abstracts that entered this step.

### **Step 3. Are these measurements properly and thoroughly measured?**

To determine whether the measurements were properly and thoroughly measured requires looking at the details of the materials and methods used which are only available from the full paper, not the abstract.

### **Step 4. Are authors compromised by being too close to vested interests?**

To date, a high proportion of studies on GM crops have been conducted by employees of GM crop companies or by people or institutions funded by these companies. Recent evidence from the medical literature has shown that published research funded by an industry body tends to be favourable to that industry body. In any final consideration of the veracity of evidence, it is therefore important to determine how close the authors are to GM crop companies. However, this cannot be determined from the abstracts. Some information should be obtainable from the acknowledgement section of the full paper. However, this has not always occurred with GM crop company-sponsored research.

## Results

Of the nine abstracts remaining at the end of this process, the majority (6 abstracts, 67%) showed potentially adverse effects of GM crops on the health of the experimental animals, while three (33%) found no adverse effects.

The six papers showing adverse effects found evidence that GM potatoes could harm the liver and gastrointestinal tract and that GM soy could adversely affect the liver and pancreas. One paper found that GM DNA from GM corn was detectable in the intestinal contents of pigs up to 48 hours after eating. This makes it available for uptake into tissues and gut bacteria.

Three papers found no adverse effects; on the development and function of mouse testes from eating GM corn, on some biochemical measurements from eating GM potatoes and on some pathology, haematology, biochemistry and urine measurements from eating GM soy.

## Discussion

This review was done on the abstracts in the abstract list as these are being used as stand-alone evidence that GM crops are safe to eat. At times, there was not enough information in the abstracts to determine if an abstract could pass step 1. However, all the abstracts that remained at the end of the next step (step 2) did indeed appear to have come from peer-reviewed scientific journals and hence passed step 1. These papers therefore passed both steps 1 and 2. There was not enough information in the abstracts to determine if a paper should pass steps 3 or 4. Full papers would need to be obtained to determine these matters. However, the author has previously read the full papers of four of the nine final abstracts. All of these papers showed potentially adverse effects and also passed steps 3 and 4. Therefore, a considerable proportion of the papers that show adverse effects from eating GM crops are indeed sound by these criteria. In contrast, some of the papers that show no adverse effects may, on closer scrutiny, show the authors to be too close to vested interests. In short, the list of abstracts cannot be used to support the view that GM crops are safe to eat. On the contrary, there is sound evidence in the list that GM crops may have adverse effects on human health.

### **How thorough and unbiased was the literature search used to produce the list of abstracts?**

The list of abstracts did not contain many other animal production studies. However, these would have been culled in step 2 of this review. The list also did not contain some papers that would have passed all steps and which showed adverse health effects. The list also omitted findings in humans, including GM DNA from soy entering bacteria in the gut of humans and numerous papers on the serious adverse effects on people of eating tryptophan from GM bacteria as a dietary supplement. Furthermore, a literature search normally provides information about how the search was conducted such as the search engines that were used, the years searched and the terms that were used in the search engines. This was not reported for this review. Hence the professionalism and thoroughness of the literature review may be inadequate.

## Conclusion



The list of abstracts does not support claims that GM crops are safe to eat. On the contrary, it provides evidence that GM crops may be harmful to health.