Image Awareness
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Genetically Modified Foods

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Introduction

Genetically modified crops have foreign genes inserted into their DNA. The primary motivation for the development of GMO crops was the desire by Monsanto to extend the patent on Roundup herbicide. Crops were developed which are herbicide tolerant (HT). Monsanto then sells the crops and farmers are required to use the Monsanto herbicide if they grow the genetically modified crops. The six major genetically modified crops are alfalfa, sugar beets, canola, corn, cotton and soy. All of these crops are herbicide tolerant. These crops have dramatically increased the sales of Roundup and have enabled Monsanto to maintain its patent protection. More recently GMO crops have been developed that are resistant to other herbicides including glufosinate, Dicamba, and 2,4-D.

A second major characteristic engineered into GM crops is insect resistance. Some varieties of cotton and corn have genes inserted into their DNA which produce Bt toxin. The bacteria *Bacillus thuringiensis* produces this toxin which kills insects by damaging the digestive process.

Lack of Regulation

The FDA regulations which govern genetically modified foods where implemented in 1992. The regulation allows the producers of GM foods to determine on their own if their foods are GRAS (Generally Recognized as Safe). If manufacturers make this determination, safety studies are not required. The FDA justified this hands-off approach to regulation by declaring that it was not aware of any information that Genetically Modified Organisms were different "in any meaningful or uniform way" from the foods from which they were derived. In 1998 the FDA was forced to turn over tens of thousands of internal memos which revealed that FDA researchers had repeatedly warned that GMO foods were quite different from foods created using traditional breeding methods. Researchers felt the safety should be demonstrated by independent testing.

FDA documents also revealed that the executive branch of the government had made the decision to resist the spread of unnecessary regulation of GM crops to keep America the world leader in biotechnology. The man who oversaw the GMO policy for the FDA was Michael Taylor who worked as an outside attorney for Monsanto and later became the company's vice president of government and regulatory affairs. He was later appointed Deputy Commissioner for Foods at the FDA.

The vast majority of studies on GMO's are commercial in nature. Very few rigorous studies have been done. If these have shown GMO's in an unfavorable light they are invariably attacked and the researchers have often been sidelined.

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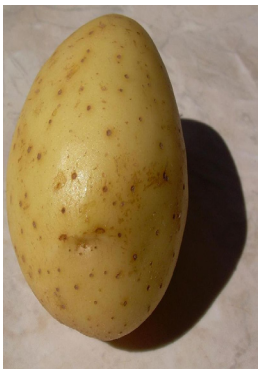
Glyphosate

The active ingredient in Roundup is glyphosate. This compound was originally patented in 1964 as a chelating agent. This means that it binds to minerals. Glyphosate was originally used as a descaling agent to remove hard mineral deposits from industrial machinery.

Glyphosate tends to induce trace mineral deficiencies in plants, animals, and people who are exposed to it. This is a consequence of the ability to strongly bind with minerals and render them unavailable for nutrient utilization. Trace mineral deficiencies induced by glyphosate can manifest in a variety of different ways.

In 1969 Monsanto was awarded a patent for the use of glyphosate as an herbicide. Glyphosate binds so strongly to minerals that it knocks out the immune system of weeds (the Shikimate pathway) resulting in their



death from microbial attack. When a mineral is pulled out of an enzyme the entire enzyme becomes worthless.

Vendors of glyphosate products argue for the safety of the product from the fact that humans do not have a Shikimate pathway. This is true, but glyphosate chelates a wide spectrum of both essential and toxic minerals. The enzyme blocking capacity of glyphosate can potentially impact a large number of enzyme systems in the human body. Virtually all enzymes have a mineral essential for the activity of that enzyme.

In 2004 glyphosate received a patent as an antimicrobial. In 2010 glyphosate was patented as a biocide due to its ability to impair the life of both plants and animals.

While humans do not have a Shikimate pathway, the bacteria in the digestive tract do. Glyphosate's activity as an antimicrobial results is alterations in the bacteria in the digestive tract (the microbiome).

Recent research has revealed that glyphosate kills a wide variety of beneficial bacteria while a number of pathogenic bacteria of the Clostridia and Salmonella families are resistant to the antibiotic effects of glyphosate.

Kruger found that glyphosate killed off a beneficial microbe which suppresses the bacteria which causes botulism. In general, glyphosate has the ability to suppress the growth of beneficial bacteria, while allowing the survival of greater numbers of pathogenic organisms in the digestive tract. The scientific term for this is dysbiosis.

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Arpad Pusztai

In 1996 it was assumed that GM foods were generally safe. The UK government embarked on a plan to require long-term safety tests for all GM foods. The task was assigned to Arpad Pusztai of the prestigious Rowett Institute. Pusztai and his associates had researched the use of an insecticide called GNA lectin from the snowdrop plant for seven years and shown it to be harmless to rats. Incorporating the insecticide into a potato seemed like a slam dunk for the production of a genetically modified potato that would kill insects but be harmless to rats and people.

To test the potato six male rats were assigned to each diet category. Rats were fed natural potato, natural potato with the lectin added, and the GM potato. Potatoes were eaten raw, boiled, or baked and all diets were supplemented with necessary nutrients. Rats were sacrificed and examined after 10 days or 110 days.

The GM potatoes were shown to adversely affect young rats in as little as 10 days. Changes were observed in brains, livers, testicles, the immune system, and the digestive tract. Both the stomach and the small intestine exhibited proliferative cell growth which is often noted as a precursor to cancer. By contrast, rats fed non-GMO potatoes spiked with the lectin were relatively unaffected. This was true even when rats had been given 700 times the GNA lectin with normal potatoes in an earlier study.

This study raised serious questions about the safety of all GM products and was not welcomed. Two days after Pusztai reported on his findings to the media with permission from his director he was released from his job after 35 years and threatened with a lawsuit if he did not remain silent about his research. The project and its 20-member research team were terminated. Some of his findings were eventually published in the British medical journal the *Lancet*. It was later revealed that the cessation of the project allegedly took place after two phone calls from the UK prime minister's office.

This remains the most in-depth feeding study of a GMO food ever published. The episode serves as a template or pattern for what has followed in subsequent studies. Independent studies usually come to the conclusion that GMO foods are harmful to animals. These studies are attacked, researchers are punished, and the results suppressed. Subsequent studies of genetically modified foods have shown that they tend to have harmful effects on the digestive tract, liver and kidneys.

This early study did not consider the safety of glyphosate or Round-Up by itself or when present with GM foods. It strongly suggests that the technology of genetic modification of foods in and of itself can be dangerous to the health of animals and humans. Linking what appears to be a safe pesticide to the DNA of a genetically modified potato created a toxic food in this study.

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Gilles-Eric Seralini

Gilles-Eric Seralini conducted a two year feeding study of rats in which they were fed Roundup Ready

Corn. Rats were fed RR corn, RR corn sprayed with Roundup, or exposed only to Roundup at varied levels in drinking water. This was a toxicity study rather than a cancer study. The study is generally criticized as a badly designed cancer study rather than as a well-designed toxicity study.

All animals evidenced organ damage to liver, kidney, and pituitary gland. Mammary tumors developed in all the animals exposed to Roundup or consuming the GMO corn. Tumors began to appear after 4-7 months on the diet or after the beginning of herbicide exposure. This is significant because industry and regulators usually look at 90 day studies for toxicity.

Changes in the health of animals in these short term studies have been classified as not biologically meaningful by GMO promoters.

Rats were given varying levels of Roundup in their drinking water. Even animals on the lowest levels of intake of the herbicide developed breast tumors. Long-term low-dose exposure of Roundup was also implicated as a contributing factor to non-alcoholic fatty liver disease.

Seralini's paper was published in the journal *Food and Chemical Toxicology* in 2012. The journal withdrew the paper near the end of 2013. Richard Goodman, who worked for Monsanto for seven years, received an editorial appointment in the journal in the interval. Goodman maintained he had no influence on the retraction of the paper.

The journal wrote, "Unequivocally, the Editor-in-Chief found no evidence of fraud or intentional misrepresentation of the data.... Ultimately, the results presented (while not incorrect) are inconclusive, and therefore do not reach the threshold of publication for *Food and Chemical Toxicology*."

The study was republished in *Environmental Sciences Europe* in December of 2014. The Serralini study suggests that feeding studies on genetically modified foods may be too short, there may be toxicological effects, and risk of cancer may be increased.

In March 2015, the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO), declared glyphosate as "probably carcinogenic to humans" (Group 2A). In effect, the world's authority on cancer ranked glyphosate, the active ingredient in Roundup, in the second highest category for carcinogenicity.

The WHO research is disturbing when one considers the fact that the majority of GMO foods are designed to be resistant to powerful applications of glyphosate. If the herbicide itself is a carcinogen, why are we altering plants so that they can be exposed to powerful doses of the herbicide.

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Conditions Improved

Jeffrey Smith has attempted to identify the health conditions most frequently improved by avoidance of GMO foods. Digestive problems were the most frequently reported improvements, with 85.2% of responses indicating improvement.

The improvement in digestion is interesting because the study by Pusztai on genetically modified potatoes discussed earlier resulted in proliferative cell growth in the lining of the stomach and the small intestines of animals fed GM potatoes.

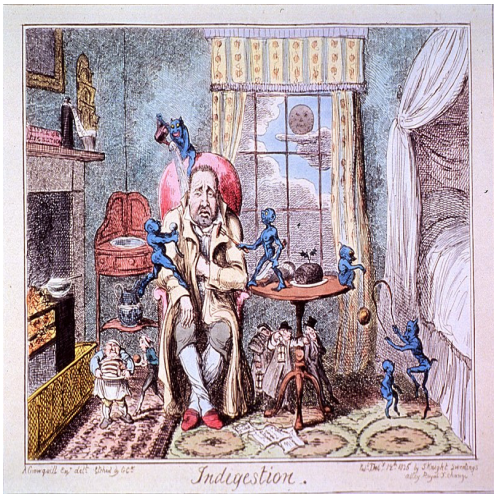
In addition to this, Kruger found that glyphosate tended to increase the numbers of harmful microbes in the digestive tract while killing beneficial organisms.

A number of genetically modified foods are designed to incorporate *Bt* toxin into every cell of a plant. This toxin destroys the digestive tract of insects by punching holes in the gut resulting in death. This bacterial toxin has been sprayed on organic crops without harmful effects.

Apparently, *Bt* toxin is not so safe when genetically engineered into foods. In nature the toxin disappears rapidly. It is ever present in GM foods.

Several studies suggest that *Bt* toxin can harm mamalian cells. A study by Aris and Leblanc found *Bt* toxin in a large number of Canadian women and their unborn children, "...Cry1Ab toxin was detected in 93% and 80% of maternal and fetal blood samples, respectively and in 69% of tested blood samples from nonpregnant women."

Mesnage and associates reported that *Bt* toxin was damaging to kidney cells. Mexxomo and associates found



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that Bt toxins induced an inflammatory response in mammals and also damaged blood cells in mice. Length of exposure increased the toxicity.

Other commonly improved conditions were the following:

Fatigue 60.4%

Overweight or obesity 54.6%

Brain fog 51.7%

Mood problems/

anxiety/depression 51.1%

Food allergies or sensitivities 50.2%

Joint pain 47.5%

Seasonal allergies 46.6%

Gluten sensitivities 42.2%

Insomnia 33.2%

Many other conditions improved as well. A number of the above conditions could be indirectly associated with the digestive difficulties which can be triggered by glyphosates or GMO foods.

Fatigue often accompanies digestive disorders due to poor nutrient utilization and immune activation resulting from development of food allergies and sensitivities when foods are incompletely digested. Poor digestion and allergies often lead to overconsumption of foods rich in sugars and fats. People also tend to overeat foods to which they are sensitive to mask withdrawal symptoms which can be quite unpleasant.

Gluten intolerance can result from incompletely digested wheat protein. Most wheat is sprayed with glyphosates which are used as a dessicant. This chelating agent inactivates an enzyme in the liver which converts vitamin D to its active form. Vitamin D is a key regulator of the tight junction in the digestive tract. When the tight junction malfunctions an individual is likely to develop a "leaky gut."

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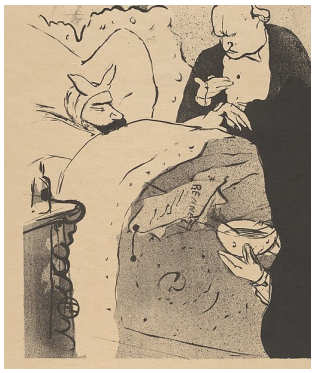

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