Council for Responsible Genetics

Table 2: Articles & Reviews Citing Adverse Effects and Uncertainties of GMOs

Author	Title-Date	Journal	Results
V.E. Prescott et al	Transgenic expression of bean alpha-amylase inhibitor in peas results in altered structure and immunogenicity	*J. Agriculture Food & Chemistry* 53:9023-9030 (2005)	Transgenic expression of a protein in a pea can lead to the synthesis of a modified form of the protein with altered antigenic properties in pea transgenic-fed mice.
M. Malatesta et al.	A long-term study on female mice fed on a genetically modified soybean: effects on liver ageing	*Histochemistry Cell Biology* 130:967-977 (2008)	GM soybean intake can influence some liver features during ageing…underlies the importance to investigate the long-term consequences of GMO-diets.
A. Finamore et al.	Intestinal and peripheral immune response to MON810 maize ingestion to weaning and old mice.	*J. Agriculture Food & Chemistry* (Nov. 16, 2008)	Italian's government's National Institute on Food and Nutrition documenting significant disturbances in the immune system of young and old mice that have been fed GM maize. Changes in the intestinal and peripheral immune responses were observed in both young and old mice fed Bt maize. The results suggest considering the gut and peripheral immune response and the age of the animal when testing GMO safety
G.E. Seralini et al	Long term toxicity of a Roundup herbicide and Roundup-tolerant genetically modified maize.	Orig. pub. *Food & Chemical Toxicology* 50(11):4221-4231 (2012); retracted then pub. *Environmental Sciences Europe* 26:1-17 (2014).	Rats exposed to GM maize and glyphosate for 2 years; female rats dies at a rate 2-3 times greater than controls; developed large mammary tumors more often and earlier in life than controls; in male rates liver congestion and necrosis observed 2.5-5.5 times more frequently than controls; severe kidney disease found 1.3-2.3 times greater with large palpable tumors occurring 4 times more than controls.
J.S de Vendomois et al.	A comparison of the effects of three GM corn varieties on mammalian health.	*Int. J. Biological Sciences* 5(7):706-726 (2009).	Side effects linked with GM maize consumption which were sex-and often dose dependent; effects mostly associated with kidney and liver, dietary detoxifying organs; data highlight signs of hepatorenal toxicity Unintended direct or indirect metabolic consequences of the genetic modification cannot be excluded.
S.W.B Ewen and A. Pusztai	Effects of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine	*Lancet* 354:1353-1354 (1999)	Genetically modified potatoes adversely affected the mucosa of the rat small intestine. No histological examinations are reported.
R. Tudisco et al.	Genetically modified soy bean in rabbit feeding: detection of DNA fragments and evaluation of metabolic effects by enzymatic analysis	*Animal Science* 82:193-199 (2006).	Enzymes examined in blood, kidney and heart; no differences in enzymes detected in serum but significant increase in a particular enzyme was found in the kidney and heart of GMO fed rabbits; this enzymatic analysis should be used to evaluate risks of GM feeding for animal and human health.
A. Velimirov et al.	Biological effects of transgenic maize NK 603xMON810 fed in long term reproduction studies in mice.	Forschungsberichte de Sektion IV Band 3/2008, 105pp. Vienna, Austria http://www.biosicherheit.de/pdf/aktuell/zentek_studie_2008.pdf	The trial showed time related negative reproductive effects of the GM maize under the given experimental conditions. The production parameters average litter size and weight in the 3rd and 4th litters of continuous breeding GM corn were statistically significant compared with non-GM groups.
I. Ermakova	Genetically modified soy		By the third generation, most GM soy-fed hamsters lost the

	leads to the decrease of weight and high mortality in rat pups of first generation preliminary studies	*Ecosinfo* 1:4-10 (2006)	ability to have babies. They also suffered slower growth, and a high mortality rate among the pups.
I.F. Pryme and Rolf Lembcke (review)	In vivo studies on possible health consequences of genetically modified food and feed—with particular regard to ingredients consisting of genetically modified plant materials.	*Nutrition and Health* 17:1-8 (2003)	"…we feel that much more scientific effort and investigation is necessary before we can be satisfied that eating foods containing GM material in the long term is not likely to provoke any form of health problems. It will be essential to adequately test in a transparent manner each individual GM product before its introduction into the market."
N.H. Fares and A.K. El-Sayed	Fine structure changes in the ileum of mice fed on endotoxin-treated potatoes and transgenic potatoes	*Natural Toxins* 6:219-233 (1998)	"Changes were observed in the structural configuration of the ileum of mice fed on GM potatoes, and even more serious defects were observed in mice fed δ-endotoxin treated potatoes."
Carrnen et al.	A long-term toxicology study on pigs fed a combined genetically modified soy and maize diet	*Journal of Organic Systems* 8 (1), 2013).	Pigs fed mixed GM-corn and GM-soy diets showed severe stomach inflammation.
Bohn et al.,	Reduced fitness of Daphnia Magna fed a Bt Transgenic Maize Variety	*Arch Environ Contam Toxicol.* 2008 Nov;55(4):584-92	Higher mortality rates, lower egg production, and fewer females reaching sexual maturation were observed in *Daphnia* fed Bt transgenic maize. The observed differences in reproductive health and fitness indicate that effects of this variety of transgenic maize are not equivalent to effects of non-GM maize, and suggest "a toxic effect rather than a lower nutritional value."
Sagstad et al	Evaluation of stress- and immune-response biomarkers in Atlantic salmon for different levels of Bt maize	*J Fish Dis.* 2007 Apr;30(4):201-12.	Small changes were observed in liver enzyme activity of salmon fed GM maize. GM-fed salmon showed significant changes in white blood cell populations. Changes in liver enzyme activity for GM-fed salmon indicate a mild stress response. The significant changes in white blood cell populations are associated with an immune response. Further study would provide more information about these immune responses.
Malatesta et al	Ultrastructural analysis of Pancreatic acinar cells from mice fed on genetically modified soybean	*J. Anatomy* 201:409-415 (2002).	Our observations demonstrate that, although no structural modification occurs in pancreatic acinar cells of mice fed on GM soybean, quantitative changes of some cellular constituents take place in comparison to control animals. In particular, a diet containing significant amount of GM food seems to influence the zymogen synthesis and processing.
Malatesta et al.	Ultrastructural morphometrical and immunocytochemical analysis of hepatocyte nuclei from mice fed on genetically modified soybean	*Cell Structure Function* 27(5):173-180 (2002).	Our observations demonstrate significant modifications of some nuclear features in GM-fed mice. In particular, GM fed-mice show irregularly shaped nuclei, which generally represents an index of high metabolic rate, and a higher number of nuclear pores, suggestive of intense molecular trafficking. Moreover, the roundish nucleoli of control animals change in more irregular nucleoli with numerous small fibrillar centres and abundant dense fibrillar component in GM-fed mice, modifications typical of increased metabolic rate. Accordingly, nucleoplasmic (snRNPs and SC-35) and nucleolar (fibrillarin) splicing factors are more abundant in

			hepatocyte nuclei of GM-fed than in control mice. In conclusion, our data suggest that GM soybean intake can influence hepatocyte nuclear features in young and adult mice; however, the mechanisms responsible for such alterations remain unknown.
Sissener et al	A long term trial with Atlantic salmon (Salmo salar L.) fed genetically modified soy; focusing general health and performance before, during and after the parr–smolt transformation.	*Aquaculture* 294:108-117 (2009)	Intestinal indices exhibited some differences between the groups, with the mid-intestine being consistently smaller in the GM fed fish throughout the experiment, while the distal intestine was different at one sampling point, shortly after seawater transfer. Plasma triacylglycerol (TAG) levels were higher in the GM group overall in the experiment, although the magnitude of the difference was larger around the time of seawater transfer compared to later samplings.
Kilic et al. & A.T. Akay	A three generation study with genetically modified Bt corn in rats: Biochemical and histopathological investigation	*Food & Chemical Toxicology* 46:1164-1170 (2008).	"In conclusion, although the results obtained from this study showed minor histopathological and biochemical effects in rats fed with Bt corn, long-term consumption of transgenic Bt corn throughout three generation did not cause severe health concerns on rats. Therefore, long-term feeding studies with GM crops should be performed on other species collaboration with new improving technologies in order to assure their safety."
Atremis Dona & Ioannis S. Arvantioyannis Review	Health Risks of Genetically Modified Foods	*Critical Reviews in Food Science and Nutrition* 49:164-175 (2009)	"The results of most studies wotj GM foods indicate that they may cause some toxic effects such as hepatic, pancreatic, renal or reproductive effects and may alter the hematological, biochemical, and innunological parameters. However, many years of research with animals and clinical trials are required for this assessment."
`A.S. Bawa & K.R. Anilakumar Review	Genetically modified foods: safety, risks and public concerns—a review	*J. Food Science Technology* 50(6):1035-1046 (Nov-Dec 2013).	"One has to agree that there are many opinions (Domingo *2000*) about scarce data on the potential health risks of GM food crops, even though these should have been tested for and eliminated before their introduction. Although it is argued that small differences between GM and non-GM crops have little biological meaning, it is opined that most GM and parental line crops fall short of the definition of substantial equivalence. In any case, we need novel methods and concepts to probe into the compositional, nutritional, toxicological and metabolic differences between GM and conventional crops and into the safety of the genetic techniques used in developing GM crops if we want to put this technology on a proper scientific foundation and allay the fears of the general public."
Cisterna, B., Flach, F., Vecchio, L. et al.	Can a genetically-modified organism-containing diet influence embryo development? A Preliminary study on pre-implantation mouse embryos.	*European Journal of Histochemistry*, 52(4):263-267 (October-December, 2008),	The results of immunocytochemical and in situ hybridization analyses demonstrated quantitative differences between embryos from GM and non-GM fed mice. These results suggest a temporary decrease of pre-mRNA transcription and splicing in 2-cell embryos from mice fed GM soybean as well as resumption at the 4-8-cell stage, although hnRNP levels remain lower in embryos from GM fed mice.
Vecchio, L., Cisterna, B.,	Ultrastructural analysis of testes from mice fed on	*European Journal of Histochemistry* 48	In GM-fed mice of all ages considered, the number of perichromatin granules is higher and the nuclear pore density

Malatesta, M. et al	genetically modified soybean.	(4):449-454 (Oct-Dec 2004).	lower. Moreover, we found enlargements in the smooth endoplasmic reticulum in GM-fed mice Sertoli cells. A possible role played by traces of the herbicide to which the soybean is resistant is discussed.	
Aris, A. and Leblanc, S.	Maternal and fetal exposure to pesticides associated to genetically modified foods in Eastern Township of Quebec, Canada	*Reproductive Toxicology* 31:528-533 (2011).	The first study to highlight the presence of pesticide-associated genetically modified foods in maternal , fetal and nonpregnant women's blood. 3-MPPA and Cry1ab toxin are clearly detectable and appear to cross the placenta to the fetus.	