

Testimony for March 15 HB 6519, Committee on Public Health, Connecticut State Legislature

We have entered a Brave New World in which the science is not exact. There is much we do not know about this world of RNA. Originally scientists believed that genes coded proteins, the building blocks of life. In completing the human genome project, scientists now realize that this simple relationship between DNA and proteins is far more complex. Much of the information in DNA is non-coding. This non-coding RNA which is more than half the information in our DNA turns on and off protein-coding RNA. Scientists are discovering a whole realm of RNA-based diseases, such as cancer, auto-immune diseases, Alzheimer's, and any viral diseases. Viruses for example are RNA-based life forms that carry RNA. One disturbing feature of RNA is that it mutates easily forcing medical science into playing catch-up. While this new RNA science opens up the possibility of new cures, such as the ability to turn on and off cancer making RNA, the technology of gene therapy is not exact with so-called Off-Target Effects (OTEs) which could be as detrimental to health as the original disease. So what has this all to do with genetically engineered food? RNA technology is used to make GE foods. While the FDA's GRAS (Generally Recognized as Safe) requirements is directed at the protein level, "If it looks like a tomato, it is a tomato," I am concerned about what is going on at the RNA level. What are the effects of transgenic RNA? Are they really broken down in the host's digestive tract, or do they pass through to effect cell function, as a Chinese study suggests? This should be reason for alarm and caution not to rush into an untested science for which the consequences could be long term and dire.

An announcement for a Conference on RNA Biology in Barcelona, 2012, organized by IMPPC (Institut de Medicina Predictiva i Personalitzada del Cancer) says the above in better language:

In recent years RNA Biology has emerged as a strong field that is highly relevant for many physiological and pathophysiological processes. Protein-coding, non-coding RNAs and the RNA-binding proteins that are found associated with them forming ribonucleoprotein complexes (RNPs), control multiple cellular functions and pathways. Non-coding mRNAs such as microRNAs and lincRNAs, far from being "junk" RNA as originally thought, play a critical role in determining the development and maintenance of different types of cancer and other diseases. Disrupted functions of RNAs and RNPs are the cause of numerous diseases and therefore, the study of the RNA offers many new opportunities for novel diagnostic and therapeutic intervention.

Supporting material:

Basics on RNA: What is RNA? <http://www.news-medical.net/health/What-is-RNA.aspx>

MicroRNAs in Human Cancer: <http://www.ncbi.nlm.nih.gov/pubmed/23377965>

Off-Target Effects:

http://www.thermoscientific.de/eThermo/CMA/PDFs/Various/File_7332.pdf

Chinese study of transgenic microRNA:

<http://www.nature.com/cr/journal/v22/n1/full/cr2011158a.html>

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Materials in Support of Testimony March 15 HB6519 - An Act Concerning the Labeling of Genetically Engineered Food

A. Major food companies to support labeling:

Ben and Jerry's to remove all GMOs by end of year with no price increase.
<http://www.addisonindependent.com/201303vt-house-passes-gmo-labeling-bill>

WalMart asking FDA to require labeling GMO foods
http://grist.org/food/are-walmart-and-big-food-pushing-for-gmo-labeling/?utm_campaign=daily&utm_medium=email&utm_source=newsletter

Whole Foods Market has officially committed to labeling GMO products by 2018. <http://media.wholefoodsmarket.com/news/whole-foods-market-commits-to-full-gmo-transparency>

Ironically, Monsanto supported GMO labeling in Europe, until they saw sales slump there.
http://www.naturalnews.com/037222_GMO_labeling_Monsanto_Europe.html

B. AMA: Trust but Verify Genetically Modified Foods

It seems that the AMA is actually split over GMO foods, which is reflected in their public statement about labeling GMO foods. Some members have called for mandatory labeling, while others say there isn't enough science to show that such foods pose a risk to human health. "Although there has not yet been shown any proven health risk by foods coming from plants or animals, who's DNA has been tweaked, the AMA still would like to see such foods go through a mandatory pre-market safety approval process." Therefore, "Although the AMA does not support labeling, it does support pre-market safety assessments." The rub is that the FDA does do the any rigorous pre-market testing of the safety of GMO foods.

<http://www.medpagetoday.com/MeetingCoverage/AMA/33362>

<http://www.medpagetoday.com/MeetingCoverage/AMA/33338>

<http://www.ncbi.nlm.nih.gov/pubmed/21338670>

C. Suppression of Research.

This is an important article in *Scientific American* stating that no independent research is being done on GMO foods and recommends the removal of user agreements that prohibit independent testing.
<http://www.scientificamerican.com/article.cfm?id=do-seed-companies-control-gm-crop-research>

D. Health Risks of GMO foods

For a good general statement see the American Academy of Environmental Medicine. The AAEM states that GMO foods do pose serious health threats and that it is imperative to adopt a precautionary principle and have a moratorium on GMO foods until proven safe.
<http://www.aaemonline.org/gmopost.html>

A decade-long project to develop genetically modified peas with built-in pest-resistance has been abandoned after tests showed they caused allergic lung damage in mice.
<http://www.newscientist.com/mobile/article/dn8347-gm-pea-causes-allergic-damage-in-mice.html>

The European Food Safety Authority's Genetically Modified Organisms (GMO) Panel has adopted a scientific opinion to determine the potential for an allergic reaction by genetically modified plants and microorganisms and derived food and feed... It is possible that GM food and feed could contain proteins which may cause food allergies in both people and animals. Because of this, EU legislation requires that the possibility of allergens in GMOs and food and feed derived from GMOs be assessed before these products are placed on the market."
<http://www.foodsafetynews.com/2010/08/efsa-assesses-allergens-in-gmos/#.UUIGBta-ouV>

GMO crops are often grown with large amounts of herbicide that are quite possibly toxic. Research has found that a specific inert ingredient, POEA, in the Roundup Ready herbicide was more deadly to human embryonic, placental and umbilical cord cells than the herbicide itself. The research team suspects that this popular herbicide might cause pregnancy problems by interfering with hormone production, possibly leading to abnormal fetal development, low birth weights or miscarriages.
<http://www.scientificamerican.com/article.cfm?id=weed-whacking-herbicide-p>

In 2011, doctors at Sherbrooke University Hospital in Quebec found Bt-toxin in the blood of 93 percent of pregnant women tested, 80 percent of umbilical blood in their babies, and 67 percent of non-pregnant women.... This raises the scary possibility that eating Bt corn might, in fact, turn your intestinal flora into a kind of "living pesticide factory", which

essentially manufactures Bt-toxin from within your digestive system on a continual basis which, scientists believe that this could reasonably result in gastrointestinal problems, autoimmune diseases, food allergies and childhood learning disorders.

<http://www.digitaljournal.com/article/326208>

<http://www.ncbi.nlm.nih.gov/pubmed/21338670>

Here's one on Glyphosate, the active ingredient in Roundup Ready, being more toxic than originally thought.

http://www.organicconsumers.org/articles/article_27101.cfm

Linking Roundup Ready pesticides to Parkinson disease.

http://www.naturalnews.com/037786_Roundup_pesticides_Parkinsons.html

Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize

<http://www.ncbi.nlm.nih.gov/pubmed/22999595>

Health risks of Bt Toxin based on Seralini study.

<http://www.safelawns.org/blog/2012/02/new-study-genetically-modified-corn-toxic-to-humans/>

E. More studies on adverse effects of GE corn, soy, and potatoes; including classic studies by Pustzai and Seralini:

Ewen S, Pustzai A. Effects of diets containing genetically modified potatoes expressing *Galanthus nivalis* lectin on rat small intestine. *Lancet*. 354:1353-1354. <http://www.ncbi.nlm.nih.gov/pubmed/10533866>

Finamore A, Roselli M, Britti S, et al. Intestinal and peripheral immune response to MON 810 maize ingestion in weaning and old mice. *J Agric. Food Chem*. 2008; 56(23):11533-11539.

<http://www.ncbi.nlm.nih.gov/pubmed/19007233>

Kilic A, Aday M. A three generational study with genetically modified Bt corn in rats: biochemical and histopathological investigation. *Food Chem. Toxicol*. 2008; 46(3):1164-1170.

<http://www.ncbi.nlm.nih.gov/pubmed/18191319>

Malatesta M, Boraldi F, Annovi G, et al. A long-term study on female mice fed on a genetically modified soybean: effects on liver ageing. *Histochem Cell Biol*. 2008; 130:967-977.

<http://www.ncbi.nlm.nih.gov/pubmed/18648843>

Séralini GE, Clair E, Mesnage R, Gress S, Defarge N, Malatesta M, Hennequin D, de Vendômois JS. Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize.

Food Chem Toxicol. 2012 Nov;50(11):4221-31. doi: 10.1016/j.fct.2012.08.005. Epub 2012 Sep 19.
<http://www.ncbi.nlm.nih.gov/pubmed/22999595>

Velimirov A, Binter C, Zentek J. Biological effects of transgenic maize NK603xMON810 fed in long term reproduction studies in mice. Report-Federal Ministry of Health, Family and Youth. 2008.
http://www.biosicherheit.de/pdf/aktuell/zentek_studie_2008.pdf

F. EPA regulation or lack thereof:

Starlink Corn and Related Cases:

Benefits of Bt crops, and biotechnology generally, can be realized only if risks are assessed and managed properly. The case of Starlink corn, a plant modified with a gene that encodes the Bt protein Cry9c, was a severe test of U.S. regulatory agencies. The U.S. Environmental Protection Agency had restricted its use to animal feed due to concern about the potential for allergenicity. However, Starlink corn was later found throughout the human food supply, resulting in food recalls by the Food and Drug Administration and significant disruption of the food supply.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1240687/pdf/ehp0110-000005.pdf>

<http://www.gmwatch.org/gm-firms/11153-bayer-a-history>

<http://www.centerforfoodsafety.org/2011/01/27/usda-decision-on-ge-alfalfa-leaves-door-open-for-contamination-rise-of-superweeds/>

Roundup toxicity and residue in food, Monsanto's request to increase EPA allowable residue on soybeans by a factor of three.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1257636/>

No EPA defined tolerance for BT toxin residue in blood
<http://www.gmwatch.org/latest-listing/1-news-items/13926-syngenta-charged-with-lying-over-cattle-deaths>

G. Playing with Fire:

Half the genes in DNA have nothing to do with making proteins; rather they function to turn on and off making of proteins. Scientists are beginning to question whether they can even talk about "genes". We have entered a brave

new world of science, of which we are not in full control and know the full consequences of our acts. We do not know the full off target effects (OTE) of using messenger RNA to turn on and off genes. The study below is significant because it reveals that some transgenic RNA is not broken down in stomach and can pass through intestinal walls to affect cell function.

Chinese researchers found small pieces of rice ribonucleic acid (RNA) in the blood and organs of humans who eat rice. The Nanjing University-based team showed that this genetic material will bind to receptors in human liver cells and influence the uptake of cholesterol from the blood.
<http://www.nature.com/cr/journal/v22/n1/full/cr2011158a.html>

<http://www.theatlantic.com/health/archive/2012/01/the-very-real-danger-of-genetically-modified-foods/251051/>

“In the present study, we were surprised to detect exogenous plant miRNAs in the serum and plasma of human and animals. Over half of plant miRNAs detected in serum and plasma are present in MVs. Further *in vitro* and *in vivo* analysis demonstrated for the first time that food-derived exogenous plant MIR168a can pass through the mouse gastrointestinal (GI) track and enter the circulation and various organs especially the liver where it cross-kingdomly regulates mouse LDLRAP1 protein expression and physiological condition.”

H. Environment and Farming

Contrary to often-repeated claims that today's genetically-engineered crops have, and are reducing pesticide use, the spread of glyphosate-resistant weeds in herbicide-resistant weed management systems has brought about substantial increases in the number and volume of herbicides applied.

<http://www.enveurope.com/content/24/1/24>

<http://gmwatch.org/latest-listing/51-2012/14041-new-benbrook-data-blow-away-claims-of-pesticide-reduction-due-to-gm-crops>

A thoughtful statement on corporate takeover of agriculture and the final transfer of the collective farming wisdom of the human race into corporate hands.

http://e360.yale.edu/feature/why_i_still_oppose_genetically_modified_crops/2191/

ADDENDUM

The Pusztai Affair (cribbed from Wikipedia):

Árpád Pusztai is a Hungarian-born biochemist and nutritionist who spent 36 years at the Rowett Research Institute in Aberdeen, Scotland. He is a world expert on plant lectins, authoring 270 papers and three books on the subject. In 1998 Pusztai publicly announced that the results of his research showed feeding genetically modified potatoes to rats had negative effects on their stomach lining and immune system. (*Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine.*) This led to Pusztai being suspended and his annual contract was not renewed. The resulting controversy became known as the Pusztai affair.

Pusztai's has moved back to Hungary. He has been giving lectures on his GE potato work and on claimed dangers in general of genetic engineering of crop plants. In 2005, he received the Whistleblower Award from the German Section of the International Association of Lawyers against Nuclear Arms (IALANA) and the Federation of German Scientists (VDW). In 2009, Pusztai and his wife received the Stuttgart peace prize (Stuttgarter Friedenspreis).

http://en.wikipedia.org/wiki/Pusztai_affair

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