Testimony to the Committee On Agriculture, Conservation and Forestry
for the hearing on 30 April 2015
concerning two GMO-related bills

LD 991: An Act To Amend Maine's Genetically Modified Food Products Labeling Law
and
LD 1326 (SP 478): "An Act To Require Labeling of All Genetically Modified Products"

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I am unable to attend the April 30 hearing, and appreciate your attention to this testimony submitted in written form. I am a Southwest Harbor resident whose undergraduate training was in biochemistry, graduate work in physiological chemistry. I have been studying the issues surrounding GMOs for the last couple of years, accumulating a library of relevant books, videos, and audio interviews, and have a website (above) providing many resources on the subject.

The issue at hand -- safety

This testimony applies to both bills, because it concerns the issue that underlies both -- ***the inherent safety or lack thereof of GMOs*** (genetically-engineered products intended directly or indirectly for human consumption). If there is no safety issue, there is no need for labeling, but if there is, you must decide whether those who recognize a legitimate concern about safety have a right to know whether or not what they are eating makes use of GMOs. This testimony
(a) takes a brief look at the history of GMOs, to indicate why there is controversy, and then
(b) states explicitly some of the concerns scientists have raised about the potential for harm.

The opposition to this concern

The processed food industry and the food-related biotech companies have long held that their GMOs are no different from organisms bred in the traditional way. I'm sure you have heard plenty on that subject from their representatives. That this is an incorrect assertion, and one knowingly made falsely, can be seen by a brief history of the industry. And in an irony that would be funny if it were not so dangerous, the industry defends the patentability of its products by insisting this non-existent difference *does* exist.

Where the "no-difference" assertion came from

In 1977-78, two "scientific" meetings were held, designed for the express purpose of persuading the public and government that genetic engineering was harmless and needed no regulation. The participants were selected to include molecular biologists with biotech corporate connections and to exclude genetic biologists and ecologists who understood how organisms interact with each other and the real world. The organizers expressly stated their goals as political PR, not scientific, and the public summaries of those meetings claimed, despite internal contradictions, that genetic engineering as such was safe. And the organizers did succeed in obscuring the risks.

As time passed, the biotech industry, and Monsanto in particular, funded research that supported

this assertion, and particularly that GMO foods are safe. Results of their studies that did not support this were suppressed, though some data was unearthed by lawsuits. The research that managed to be carried out independently, without Monsanto funding, tended to find health problems. Such researchers often found difficulty getting published, and when they did, were attacked in a coordinated way as having done "bad science," or even being "anti-science" (!)

What can be considered the final straw in the assertion of GMO/non-GMO equivalence was its invocation by the FDA in 1992, which declared that it, the FDA, had *"no basis for concluding that bioengineered foods differ from other foods in any meaningful or uniform way, or that, as a class, foods developed by the new techniques present any different or greater safety concern than foods developed by traditional plant breeding.*"

What wasn't known until much later, when a lawsuit forced the FDA to turn over its records relating to that decision, was that the FDA ***had known all along that this was false. Their own scientists had repeatedly provided reasons (sometimes in UPPERCASE letters) for serious concern about safety***, but were faced with a series of revisions of the draft if the proposed FDA ruling that inexorably removed their concerns until none were left.

It's important to understand that the architect of this falsification, attorney Michael Taylor (formerly -- and later -- representing Monsanto), had been installed in the FDA in a new position set up expressly for this purpose, in response to Vice President Dan Quayle's "competitiveness" program of eliminating government regulation.

What did those suppressed FDA scientist know?

First, how did that genetic engineering ("recombinant DNA") work? That 1970s/80s technology for inserting modified genes into the DNA of a plant (or animal; I'll stick with plants here) involves either infecting cells with bacteria already containing the modified genes, or blasting the genes into the cell nucleus with, literally, a "gene gun." There is no control over where in the genome the insertion actually happens, or what kind of collateral damage occurs. The blasted-or-infected cells are then grown in tissue culture to see which of them actually got the new gene.

The only way to determine this before turning them into a plant is to include a "marker gene" in the gene-transfer "cassette" along with the new gene. The marker gene of choice is one that conveys antibiotic resistance, so that when the altered cells are cultured in an antibiotic medium, the ones that didn't get the desired gene die. The remaining cells are thus known to have the desired gene, and are cultured into plants. However, ***all the cells in such a plant retain the gene for antibiotic-resistance***. The potential threat was obvious -- at least to the FDA scientists.

To make sure the new gene will actually work in its alien environment, the "cassette" also includes a "promoter" gene -- one that turns on the new gene and keeps it running 24/7. This is *not* the way genes are supposed to work. They are turned on and off as needed. Having one running 24/7 is like having a running faucet that can't be turned off. Like the FDA scientists, you can see how this might be a problem. What made it worse is that some promoter genes can control the "expression" of a number of different genes. Could this new promoter gene turn on unintended genes and get them running 24/7? The FDA scientists were concerned about this, too. Of course, no one was going to know the answer to these concerns, since they were suppressed.

What the FDA scientists didn't know -- it gets worse

Before the Human Genome Project was completed in 2003, it had been assumed that one gene made one protein which had one function -- an enzyme, a building block, or whatever. Given this, one might argue (though poorly) that it really didn't matter where blasted-in DNA wound up in the genome. The most you could damage would be the protein produced next door. But the Human Genome Project revealed this understanding to be seriously flawed. It became clear that genes function not only as producers, but also as regulators of the expression of other genes. The genome was not simply a long string of isolated genes connected together, but an extremely complicated network about whose functional details we had virtually no clue. This ruled out any simplistic assumptions of safety, as well as the concept of engineering for traits like drought tolerance or increased yield, both of which are the result of very complex combinations of many genes. And despite endless promises, the industry has failed to make good on these traits.

> ***In the end, recombinant DNA technology has proven to be not only old, outdated science, but insistence on it has made it the "bad science." And dangerous.***

So why worry?

DNA is a long necklace of beads called "bases." Through an intermediary (RNA), these bases organize and assemble the amino acids that make up proteins. If that necklace is damaged, or broken, or pieces are knocked out, "novel" proteins can (and do) result. Among other things:

- they can be similar to the usual ones, but folded in abnormal ways that make them act biologically very differently,
- they can be completely new and act as powerful or subtle poisons or allergens,
- they can change the level of nutrients in a plant, which can be good, or, more likely, bad,
- and the protein that is produced is not always the intended one, and can change over time.

The only kind of non-feeding study that can determine whether this is happening is called a "proteomic" study. One of the few independent proteomic studies that have been done on a GMO crop found scores of proteins that were either being expressed very differently or were brand new. The industry, on the other hand, having not done such studies, claims this doesn't happen.

Not just a potential danger

You will be told that there is no danger, that not a single person has gotten sick from GMOs.

In 1989, a mysterious syndrome appeared that ultimately affected thousands of Americans, involving violent pain, inflammation, skyrocketing white blood cells and a host of other symptoms. Dubbed *eosinophilia myalgia syndrome* (EMS) it was ultimately traced to an L-tryptophan supplement made by the one Japanese company that had switched its manufacturing to a GMO version of the usual bacteria. The GMO industry did their best to put up a smoke-screen, claiming that the problem was bad filtering -- despite EMS having started before the filtering change and not answering the question of how the undetected contaminant had only started when the engineered bacterium started to be used. Thousands of people were sickened,

many disabled, and several died. (But nevertheless, "not a single person has gotten sick...")

In the U.K., in the immediate aftermath of the introduction of GMO soy, soy allergies went up 50%. Levels of trypsin inhibitor, which is a known allergen, were found to be almost 30% higher in GMO soy, and it proved more resistant to cooking degradation. (But nevertheless, "not a single person has gotten sick...")

> ***The point here is that if these GMO-induced problems hadn't had three key characteristics -- they were unusual, they were acute, and they came on suddenly -- they would never have been noticed. If there is a GMO link to chronic diseases like diabetes and cancer and autism (to name a few), how would we know?***

You will be told that the altered DNA isn't a problem -- it's destroyed during digestion. Well, no.

In the *only* human GMO feeding study ever done, the "Round-up ready" gene in GMO soy was found not only to have survived digestion, but to have been incorporated into gut bacteria, presumably churning out its protein 24/7, a protein which for some people might be allergenic.

One type of GMO corn produces Bt toxin, a "natural" insecticide that perforates the guts of the insect. A large proportion of cows are fed on this corn, and we drink their milk and eat their meat. A study a few years ago of pregnant women found that Bt toxin had showed up in 93% of their blood and 80% of their umbilical cords. The fact that it was there at all, instead of having been washed out of the blood, may indicate that, like the Round-up ready gene above, the insecticide is being constantly produced by gut bacteria that have taken up the Bt toxin gene.

Testing

The FDA doesn't require testing (or even notification) prior to a GMO going on the market. Instead, it sends a letter to the company pointing out that the FDA makes no claims of safety, that it is up to the company to ascertain safety. But Monsanto refuses to make its seeds available to independent researchers, and the studies it funds are short-term -- e.g., rats for 90 days.

The one major independent study that ran for a full rat life cycle -- 2 years -- found serious liver and kidney toxicity and damage, and tumors which started shortly after the first 90 days. Monsanto, which produced an instantaneous "nuclear" attack to discredit that study (on false grounds), has since acknowledged it has a whole department whose purpose is to do just that.

In one of its studies, Monsanto declared there had been no significant difference between GMO fed rats and regular rats. A lawsuit brought out the data, and it turned out there were biologically significant differences in *over fifty* different parameters.

> ***Epidemiological studies point to the likelihood that GMOs are at least participants in the radical increase in chronic disease that has occurred since their introduction. But the fact is, without GMO labeling to make non-GMO control groups possible for scientific studies, it cannot be specifically proven or disproven whether "no human has gotten sick" -- and it is this which is the real underlying reason for the industry's opposition to GMO labeling.***

It's not just GMOs as such that present danger

Glyphosate, the main ingredient in Monsanto's Roundup herbicide, is sprayed universally on Monsanto's GMO "Roundup-Ready" crops and is taken up into those plants. It has been declared by the World Health Organization to be a ***Class 2a Probable Human Carcinogen***, which ranks it above lead and mercury and dioxin, among others. And it has been found in air, water, and soil samples all over the country.

Glyphosate kills plants by (a) robbing them of vital trace minerals, (b) interfering with a fundamental biochemical pathway (the shicamate pathway) that is necessary for the "good" bacteria in your gut, which form a large part of your immune system and your access to nutrition, while (c) not interfering with many of the "bad" bacteria underlying disease. The failure of the shicamate pathway has clear links to a large number of the chronic physical and mental diseases that have mushroomed in the two decades since the introduction of GMOs into our food supply.

Labeling is no big deal -- elsewhere

The industry is spending tens of millions of dollars trying to defeat GMO labeling bills in the U.S., including massive TV advertising in California, Washington State, and Colorado that made utterly false assertions designed to *scare* people that their food costs were going to increase, succeeding in turning strong majorities for labeling into narrow defeats. On the other hand, the industry claims to be fighting labeling because it will *scare* people unnecessarily. However, all the GMO foods sold in Europe are now labeled, and there was no concomitant increase in prices or problems for the grocery chains there when that happened. And the decisions by those grocery chains to sell GMO food only if it was labeled were voluntary and spontaneous.

Conclusion

There is no doubt any more that GMOs present dangers, both actual and potential.

This has been shown over and over again in independent studies. Some are known human dangers, others have shown up in well-designed peer-reviewed rat studies, others are theoretically and scientifically to be expected but have yet to be adequately studied. The existence of this universe of data is all the more remarkable for the obstacles, counter-attacks, and overwhelming funding put forth against it by the industry.

Would you want to know if a Class 2a carcinogen was included in what you were eating? Knowing about the above-mentioned body of scientific data, would you prefer to be aware of which of the vast proportion of processed foods that are available for you to eat contain GMOs or GMO-sourced ingredients? Do you think it is important that we make it possible for science to do real, solid studies establishing what dangers we need to be on the lookout for?

If so, it makes sense to support thorough GMO labeling, without the usual industry-supplied delaying requirement that other states adopt it first. Vermont has done so, and successfully defended its law in court. Our motto of "Maine leads" is beginning to look shaky.

References on the next page

Brief list of references you might find useful

This page: http://dickatlee.com/issues/gmo/pdf/150430_hearing_testimony.pdf

Audio/Video interviews

- The best introduction to GMO issues that I have encountered:
  "You're Eating What?" by Jeffrey Smith
  http://responsibletechnology.org/multimedia/youreeatingwhat.mp3
- Science underlying the safety concerns about GMOs:
  Interview with British genetic engineer **Dr. Michael Antoniou**
  http://dickatlee.com/issues/gmo/mp3/ma267.mp3
- Science laying out the dangers of glyphosate:
  Interview with retired Perdue University soil bacteria expert **Dr. Don Huber**
  http://dickatlee.com/issues/gmo/mp3/don_huber_perdue_glyphosate.mp3
  Lecture by former Health Canada GMO spokesperson, Dr. Thierry Vrain
  https://www.youtube.com/watch?v=yiU3Ndi6itk

Articles/Books/DVD

65 Health Risks of GM Foods
http://responsibletechnology.org/gmo-dangers/65-health-risks
Summarizes the issues presented in detail in *Genetic Roulette* (below)

Genetic Roulette: The Documented Health Risks of Genetically Engineered Foods
by Jeffrey Smith
http://www.amazon.com/dp/0972966528
A book intended for legislators. The first half is presented in easy-to-read two-page spreads: left page is for quick scanning, with bullets, illustrations, and quotes; right page is fully referenced text, describing both research studies and theoretical risks. The second half shows how GM crop safety assessments aren't adequate to identify the health problems presented in the first half.

Genetic Roulette DVD:
Amazon:
Book: http://www.amazon.com/dp/B0096DP4CG
Instant video: http://www.amazon.com/dp/B00J2PBTSG
Maine interlibrary loan:
http://minerva.maine.edu/search/?searchtype=t&SORT=D&searcharg=genetic+roulette&searchscope=71

GMO Myths and Truths
http://earthopensource.org/earth-open-source-reports/gmo-myths-and-truths-2nd-edition/
Available free online, this is a major reference that deals with each of the areas of concern and provides information about the hundreds of scientific studies that support those concerns.

Altered Genes, Twisted Truth: How the venture to genetically engineer our food has subverted science, corrupted government, and systematically deceived the public
by Steven M. Druker
http://www.amazon.com/dp/0985616903
The page-turner definitive work on the subject, by the lawyer who sued the FDA and obtained the papers detailing the true story of the fraudulence of their "substantial equivalence" doctrine.