

Foods Fights in the Marketplace A Look at Some Issu



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JIGMOD Día internacional de oposición colectiva a los OGM Journée Internationale d'Opposition Collective aux OGM Joint International GMOpposition Day



in English

according to a given Agenda.

8 April 2006

A worldwide event (see the International Program) is to be held on the 8th of April 2006, with the two

informing people and demonstrating the front of concerned organizations against GMOs (both open-air food). This action will be distributed over several Information Sites, possibly linked through Internet video (

The medias will be issued with the international program by the end of March; until then, the project

en español

.∎

<u>3 juin 2005</u> mai 2004

avril 2006.

stes

ocuments

ontact

Dia / Jour / Day:

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Visitantes / Visiteurs / Visitors: 034346

Actualizado / Mis à jour / Updated: A(pbv)ril 2006

News of the Weeks W-1

- On the 8th of April, there will be at least 120 "hot spots" on every continents (except the Antartic, maybe).
- Day "D"- 8, a quantitative view of the international mobilization against "free GMOs" : 387 'information stalls 213 stands of GMO-free farm products 138 conferences, debates, forum 123 picnics or food stalls 72 displays of movies 65 petitions 54 music bands 47 "Peasant Seeds" related actions 47 street theater performances
- 38 participants to the visioconference
- 10 radio or TV programe Prace Conferences

provine wooks

 In conjunction with JIGMOD, a three disc set launched: "The GMO Trilogy: Why Genetically Modified Organisms threaten your health, the environmer and future generations" (by Jeffrey of H. infield).













March 2004 MENDOCINO MEASURE H – passed March 2004 56% For; 44% Against

- "unlawful for any person, firm, or corporation to propagate, cultiv raise, or grow genetically modified organisms in Mendocino Cour (excludes microorganisms)
- "<u>DNA</u> or deoxyribonucleic acid means a <u>complex protein</u> that is present in every cell of an organism..."
- The ban does not pertain to properties within city limits, or lands managed by State, Tribal and Federal agencies.
- At election time, no GE organisms were known to be in production Mendocino County.



The discourse on both sides of the issue is often drive by alarming assertions and facts that were not derive from, nor supported by science

"Measure H should be rescinded...on the basis that multitudinous GMOs always been in Mendocino County and would be impossible to eliminate be

- 1. Animals such as deer, bear, racoons, etc. are impossible to exclude
- 2. Fire retardants for fighting forest fires cannot be abolished...
- 3. ...<u>in order to remove present GMOs all soil would have to be plowe</u> <u>under or removed...</u>
- 4. Birds and beees are impossible to prevent from invasion.
- 5. Any leather goods or imported footwear, clothing..would have to be inspected at checkpoints on every road coming into the county...
- 6. <u>Anyone visiting another county or coming in on a plane, train, or be</u> would have to have a security check.
- All of the above I have thoroughly investigated through pertinent organizations..."

Marie White, Ukiah Daily Journal 11/16/03



The discourse on both sides of the issue is often drived by alarming assertions and facts not derived from nor supported by science

"When my son was 6 month (sic) old and receiving chemotherapy for leukemia, he was also receiving soy lipids intraveneously because he had lost the ability to e or drink. The longer he received the lipids, the higher th dose of chemo. When I asked why, I was told that the soybeans used were genetically modified to be "Round Ready," they were putting food into my son's veins that could withstand the chemicals they were using to kill th leukemia blood cells, making the chemo less effective. order to keep my son alive nutritionally, the higher dose of chemo almost took him away " Jenny Shattuck-Hale, Ukiah Daily Journal, 2/20/04





When Did the Genetic Engineering of Foods Start and Where?



GE rennin – used to make cheese - was the first GE product in foods - 1990

COLB



The second product was a whole food – Flavr Savr and Endless Summer tomatoes – engineered for longer shelf life – marketed in 1994



These tomatoes were labeled as GM and sold in markets in Europe until...





Mad Cow Disease

happened in Europe in late 1990





Greenpeace decontaminates GM field - Lord Melchett arrested

SOURCE: 7/26/99, Lyng/Norfolk, Greenpeace



Factors that fueled controversy in Europe

- Food safety scares, "They let mad cow disease happen; he can we know the new GM foods are safe?"
- Involuntary nature of the change, "Why weren't we told we were eating these things?",
- Cultural differences, "We like our foods just the way the are!", and
- Economic incentives, "European farm subsidies are the highest in the world".



How much confidence do you have in federal government to ensure safety of food supply in U.S.? 2004 1999 31% 15% **GREAT DEAL** 54% 61% FAIR AMOUNT 19% **NOT MUCH** 14% 5% NONE **NO OPINION**





How much would you say you know about government regulation of genetically modified food?

| | Aug. | Sept. |
|----------------|-------------|-------------|
| | <u>2003</u> | <u>2004</u> |
| Great Deal | 2% | 1% |
| Some | 11% | 11% |
| Not too much | 31% | 28% |
| Nothing at all | 53% | 55% |
| Don't Know | 4% | 5% |



Pew Initiative on Food and Biotechnolo

What is the U.S. regulatory process



The New York Times

January 25, 2001

Biotechnology Food: From the Lab to a Debacle

By Kurt Eichenwald

How was the regulatory structure decided upon?



"In late 1986 four executives of the Monsanto Company, the leader in agricultural biotehnology, paid a visit to Vice President George Bush at the White House to make an unusual pitch.

'There were no products at the time,' Leonard Guarraia, a former Monsanto executive who attended the Bush meeting, recalled in a recent interview. 'But we bugged him for regulation. We told him that we have to be regulated.'

In the weeks and months that followed, the White House complied, working behind the scenes to help Monsanto – long a political power with deep connections in Washington – get the regulations that it wanted."



Coordinated Framework for Biotechnology

- Completed in 1986
- Covers full range of plants, animals & microorgani
- Based on concept of product, not process
- Based on intended use and existing statutes



Regulatory Systems in the U.S. (existing regulations)

FDA



- Field testing

 Permits
 Notifications
- Determination of non-regulated status

• Feed safety



- Pesticidal plants

 tolerance exer
 registrations
- Herbicide regist



Nine Steps of Safety Evaluation of GM Crops by US Federal Regulatory Agencie

- 1. NIH Biosafety Guidelines
- 2. USDA greenhouse standards and inspections
- 3. USDA field trial authorization
- 4. USDA authorization of transport for field trials
- 5. USDA detemination of nonregulated status
- 6. EPA experimental use permit
- 7. EPA determination of food tolerance or tolerance exception
- 8. EPA product registration
- 9. FDA review process (voluntary pre-market consultation)

Variety release requirements: Conventional cultivars

- Agronomic performance
- Proximate analysis
- Antinutritive factors







Variety release requirements: Transgenic cultivars

- Agronomic performance
- Proximate analysis
- Antinutritive factors
- Plus:



Plus:

- Molecular characterization of inserted DNA,
- Southern and restriction analyses
- PCR for several fragments,
- Various enzyme assays (ALS, NOS, NPT-II)
- Copy number of inserts
- Size of each fragment,
- Source of each fragment
- Utility of each fragment
- How fragments were recombined
- How construct was delivered into flax
- Biological activity of inserted DNA (genes)
- Quantitative analyses of novel proteins (western analyses)
- Temporal activity of inserted genes
- spatial activity of inserted genes
- complete amino acid analysis
- detailed amino acid analysis for valine, leucine and isoleucine
- Toxicity (feeding trials were not warranted)
- Allergenicity (feeding trials were not warranted)
- Biological analysis:

- Pathogenicity to other organisms
- dormancy,
- outcrossing
- potential for horizontal gene transfer
- seed production
- flowering time,
- flower morphology
- analysis of relatives
- stability of inserted genes over seed generations
- survivability in natural environment
- survivability in agricultural environment in presence of herbicide
- survivability in agricultural environment in absence of herbicide
- Interaction with other organismsalterations to traditional relationships
- Interactions with other organisms- novel species
- Changes to persistence or invasiveness
- Any selective advantage to the GMO
- Any selective advantage to sexually compatible species
- Plan for containment and eradication in the event of escape







Field Tests Authorized 1987-2006









APHIS Determination of Nonregulated Status

Alfalfa - HT

- ✓ Corn HT, IR, AP
- ✓ Soybean HT, PQ
- ✓ Cotton HT, IR
- Potato IR, VR
- Tomato PQ
- Squash VR
- ✓ Canola HT

Large-scale productionNot on market

- Papaya VR
- ✤ Rice HT
- Rapeseed HT, AP, PQ
- Sugar beet HT
- ✤ Flax HT
- Chicorium AP
- Tobacco PQ

Once determination of nonreglated status is made, organism no longer requires APHIS review for moveme or release in U.S.



The Des Moines Register

Report blasts oversight of test fields

Investigators say the USDA lacks details on what happens with pharma-crops.

By PHILIP BRASHER REGISTER WASHINGTON BUREAU

December 30, 2005

Washington, D.C. - The U.S. Department of Agriculture has failed to

"In fact at various stages of the field test process... weaknesses in APHIS regulations and internal managemen controls increase the risk that regulated genetically engineered organisms (GEO) will inadvertently persist in the environment before they are deemed safe to grow without regulation."

Excerpt from USDA Audit 2005

fields of pharmaceutical crops with the frequency that officials said they would.

"Current (USDA) regulations, policies and procedures do not go far enough to ensure the safe introduction of agricultural biotechnology," the report said.

The report "confirms the public's lack of confidence in the USDA to oversee pharmaceutical and industrial chemical crops," said Susan Prolman of the Union of Concerned Scientists, an advocacy group that has been critical of

United States Food and Drug Administratio



United States Environmental Protection Agen





Environmental Protection Agency

- EPA has jurisdiction over new chemical substances introduced into U.S. market.
- Government defines all genetically-modified microbes - including bacteria, fungi, viruses and protozoa - as new chemical substances, under EPA's authority.



Proposed EPA Plant Pesticide Rule

- EPA proposed to regulate and designate plants engineered with genes for pest resistance as pesticides and would be labeled as <u>pesticides</u>
- Scientific and professional societies found the policy scientifically indefensible and publicly fought the proposed rule because:
- Pest-resistant GE plants might be indistinguishable from conventionally bred plants, but regulated differently
- Regulation should focus on degree of risk, not the means by which plants were created
- EPA ultimately decided that such plants would be termed PIPs



Plant-incorporated protectant



Federal Decision Tree for GM Food Safety

Evaluate safety of source organism – gene/ protein

Relatedness of protein to toxicant or allergen, *e.g.*, peanuts



Safety of genes and expression products of gene

Specificity or mode of action of protein; stability of protein to digestion and processing

Establish safety of consumed food

How frequently do consumers eat the food? Artichokes vs. corn






Example of studies submitted to EPA/FDA for Bt corn

- Molecular characterization of insect protected corn line MON 810.
- Evaluation of insect-protected corn lines in 1994 U.S. field test locations.
- Assessment of the equivalence of B.t.k. HD-1 protein produced in several insect protected corn lines and Escherichia coli.
- Compositional comparison of *Bacillus thuringiensis* subsp. *kurstaki* HD-1 protein produced in ECB resistant corn and the commercial microbia DIPEL.
- Assessment of the equivalence of Bacillus thuringiensis subsp. kurstaki HD 1 protein produced in Escherichia coli and European corn borer res
- A dietary toxicity study with MON 80187 meal in the northern bobwhite.
- Aerobic soil degradation of *Bacillus thuringiensis* var. kurstaki HD-1 protein.
- Acute oral toxicity study of Btk HD-1 tryptic core protein in albino mice.
- Assessment of the in vitro digestive fate of Bacillus thuringiensis subsp. kurstaki HD-1 protein.
- Stability of the Cry1A(b) insecticidal protein of B.t.k. HD-1 in sucrose and honey solutions under non-refrigerated temperature conditions.
- Evaluation of the dietary effects of purified B.t.k. endotoxin proteins on honey bee adults.
- Activated B.t.k. protein: a dietary toxicity study with green lacewing larvae.
- Activated B.t.k. protein: a dietary toxicity study with parasitic hymenoptera (Brachymeria intermedia).
- Activated B.t.k. protein: a dietary toxicity study with ladybird beetles.
- Evaluation of European corn borer resistant corn line MON 801 as a feed ingredients for catfish.
- Cry1A(b) insecticidal protein: an acute toxicity with the earthworm in an artificial soil substrate.
- Effects of the Bacillus thuringiensis insecticidal proteins Cry1A(b), Cry1A(c), Cry3A on Folsomia candida and Xenylla grisea (Insecta: Coller
- Supplemental submission to MRID 43665502 on the expression of the Cry1A(b) protein in insect-protected line MON 810.
- Supplemental submission on the tissue expression and corn earworm (Helicoverpa zea) efficacy of the Cry1A(b) protein in insect-protected corn
- Chronic exposure of *Folsomia candida* to corn tissue expressing Cry1A(b) protein.
- Corn pollen containing the Cry1A(b) protein: a 48-hour static-renewal test with Cladoceran (*Daphnia manga*).



Safety of <u>remaining</u> edible portion of food: safe as conventional food?

Concept of substantial equivalence

Analytical assessment of safety of new food relative to existing Three outcomes:

- GE food substantially equivalent to conventional
- GE food substantially equivalent to conventional except defined differences: toxicity or allergenicity of novel pro-
- GE food not substantially equivalent to conventional



Compositional Equivalence: Proximate Analyses



These results have been generated on Event MON810. Data showing similar proximate analyses have been generated on the other corn events.



Compositional Equivalence: Amino Acids



These results have been generated on event GA21. Data showing similar amino a composition have been generated on the other corn events.



Compositional Equivalence: Fatty Acids



These results have been generated on Event Bt 11. Data showing similar fatty acid composition have been generated on the other corn events.



Compositional Equivalence: Mineral and Vitamin



These results have been generated on event Bt11. Data showing similar mineral and vitan composition have been generated on the other corn events.

Hierarchical metabolomics demonstrates substantial compositional similarity betwee genetically modified and conventional potat

"...apart from targeted changes, these GM potatoes in this st appear substantially equivalent to traditional cultivars."

SOURCE: Catchpole et al. 2005. Hierarchical metabolomics demonstrates substantial compositional similarity between genetically modi, and conventional potato crops. Proceedings of the National Academy of Sciences USA 105: 14458-144

Polyphenol content in the juices freshly may from eleven apple cultivars varied significan

Polyphenol profile (mg/L) of juices freshly made from dessert apple cultivars determined by HPLC-DAD analysis (for details see Section 2). 6 and 16 were not detectable. Numbering corresponds to that given in Section 2.

SOURCE: Kahle et al. 2005. Polyphenol profiles of apple juice. Mol. Nutr. Food Res 49:797-806

"In human gene therapy, studies have verified that insertion mutation can lead to leukemia in children...In plants the disruptions may be similarly dangerous, producing unpredicted toxins."

"Turning genes on or off is another form of Russian roulette. Whether the process creates new toxins, allergens, cancers or nutritional changes is anyone's guess."

Government Lies

"Genes can influence each other. Proteins can influence each other. With each change, a new interaction can begin setting off yet more changes. This type of unpredicted chain reaction" may have caused the 'deadly' tryptophan epidemic

Jeffrey M. Smith

What are some food safety issues?

- No peer-reviewed food safety tests
- Creation of allergens or activation of toxins
- Pharma crops contaminate food supply
- Labeling
- Changes in nutritional content
- Gene flow from food to intestinal bacteria; increase in antibiotic resistance

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Difficulties with food safety testing What to do and how to do it?

"It is difficult if not impossible to test food safety of whole foods and feeds with animal tests. Despite what non-experts commonly think, animal tests are not the gold standard. Compositional analysis and toxicity testing of individual components is much more sensitive than whole foods testing."

"Nutritional and Safety Testing of Foods and Feeds Nutritionally Improved through Biotechnology" 2004. *Comprehensive Reviews in Food Science and Food Safety*, ILSI

"There are publications on the toxicity and animal testing of Bts and at leas 112 studies of food safety of GM crops in animals."

Bruce Chassy, Chair, Department of Food Science and Human Nutrition, University of Illinois

"Preventing adverse health effects...requires application of appropriate scientific methods to predict and identify unintended compositional chang that may result from genetic modification of plants, animals and microbes However "it is the final product...rather than the modification method or process, that is more likely to result in unintended adverse effects."

National Academy of Sciences report, ... "Safety of Genetically Engineered Foods: Approaches to Unintended Health Effects" (2004)

Poultry and Egg Study: Bt Protein Analysis

- > 14 day poultry feeding study
- Diet: contained 64% grain (Bt or non Bt)
- Eggs collected on days 13 & 14
- Muscle and liver samples collected on day 14

<u>Tissue</u>

- > white muscle (10)
- dark muscle (10)
- liver (10)
- egg whites (10)
- egg yolk (10)

Bt Protein Analysis

Not detected Not detected Not detected Not detected Not detected

NE Beef and Dairy* Study: Bt Protein and DNA Analysis

TissueBt DNABt Protein>> muscle (24)Not detectedNot detected

>spleen (24) Not detected Not detected

> whole milk (11) Not detected Not detected

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Toxicity Assessment: Roundup Ready/CP4 EPSPS protein

No deleterious effects at highest dose (572mg/kg)

Syndenta December, 20

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V 71 <u>CA</u> VO1 Gene-Altered Bt Crops Threaten Public Health

Immune Responses and Skin Sensitization to Bt in Farm Workers and Presence of Bt in Many Genetically Engineered foods Letters from NEIL J. CARMAN, PH.D. Clean Air Program Director Lone Star Chapter Sierra Club (Texas)

"Conversely, results of this investigation should partially allay recent concerns about the occurrence of possible adverse health effects in consumers after exposure to transgenic foods. Because reactivity to the Btk pro-delta-endotoxin was only encountered in 2 of 123 worke sensitized by the respiratory route, it is unlikely that consumers would de allergic sensitivity after oral exposure to transgenic foods (e.g., tomato potatoes) that currently contain the gene encoding this protein. (Bernstein et al. 1999. Environ Health Perspect 107:575-582)

spray in GE 1000 consumers.

A health survey was conducted in farm workers before and after exposure to Bt pesticides. The investigation included questionnaires, nasal/mouth lavages, ventilatory function assessment, and skin tests to indigenous aeroallergens and to a variety of Bt spore and vegetative preparations. To authenticate exposure to the organism present in the commercial preparation, isolates from lavage specimens were tested for Bt genes by DNA-DNA bybridization.

Inadvertent Creation of Allergens and Toxin Toxin Creation Confined to GE Foods?

No – naturally occurring toxins occur as a result of classical breeding efforts, e.g., potato (glycoalkaloids) and celery (psoralens)

Allergy Creation Confined to GE Foods?

Classically bred foods cause allergy problems also – the case of the Kiwi

> Long-term Food Safety Studies Should They Be Done, How and on What Foods?

Never conclusively linked to either the new strain o bacteria used or manufacturing process, which eliminated certain filtration steps; both occurred a time of deaths. Reconstruction experiments indicate causative impurity was not related to GE technolog

Pusztai rat feeding studies

(Ewen SW and Pusztai A "Effect of diets containing genetically modified potatoes expressing *Galanthus nivalis* lectin on rat small intestine. Lancet354:1353-1354)

Were the studies conclusive? Were they relevant to other GE crops?

In late 90's rats fed potatoes engineered with snowdrop lectin. Claims that stomach damage due to lectins and other parts of genetic construct. Scientific community concluded too few animals were used and inadequate controls; experiments should be repeated. Product was never marketed.

Fumonisin Reduction with Bt-maize

- 1989: High levels of fumonisin car large-scale outbreaks of lethal lur edema in pigs, brain tumors in ho
- Fumonisin contamination caused insect infestation
- 20- to 30-fold fumonisin reduction Bt-maize

•Hammond, B. et al., (Feb. 2004), *Lower fumonisin mycotoxin levels in the grain of Bt-corn grown in the United States in 2000-2002*, J. Agric. Food Chem. 52: 1390-1397

Modified from Drew L. Kershen University of Oklahoma

Starlink corn contamination

Kraft Food recalls all taco shells sold nationwide under Taco Bell Brand

SOURCE: Washington Post, September 19, 2000

StarLink Corn

- Bt-corn approved for animal feed only due to lack of allergenicity testing
- Oct 2000: StarLink Bt gene found in foods, forcing massive food recalls
- 51 people complained of allergic reactions
- Immunological studies conducted; samples of food from consumers found no StarLink
- Starlink removed from market

Percent Positive Starlink

Percentage of Positive Starlin

| Week ending: | |
|--------------------------|--------|
| November 25, 2000 | 12.05% |
| November 30, 2002 | 1.19% |
| November 1, 2003 | 0.26% |
| November 27, 2004 | 0.00% |
| April 16, 2005 | 0.19% |
| May, 2005 | 0.00% |
| June, 2005 | 0.00% |
| July, 2005 | 0.00% |
| August, 2005 | 0.00% |
| Coctober, 2005 | 0.00% |
| November, 2005 | 0.00% |
| December, 2005 | 0.00% |

Zimbabwe and Zambia stand united on GM

THE HERALD (Harare) Wisdom Mdzungairi October 11, 2005

International scientists, including those from the Unit States, have praised Zimbabwe and Zambia for reject genetically-modified food donations from the West tc

But fears of Starlink contamination stil linger about exports to Africa

AFRICA

Council of Zambia, said "Extreme views have tended confuse many African policymakers and the public because of lack of reliable information and guidance available to the groups."

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November 14, 2002

Biotech Firm Mishandled Corn in Iowa

By Justin Gillis

The biotechnology company that mishandled gene-altered corn in

Production of pharmaceuticals in edible crop cause concern

U.S. Department of Agriculture ordered 155 acres of Iowa corn pul up in September and incinerated.

Corn engineered with protein that kills sperm

SOURCE: Capital Press, November 2001. "Contraceptive corn, healthful tobacco: 'Pharming' takes root

The Mercury News

March 30, 2004

'Pharm crop' debate takes root in California Biotech

April 2004

YICalifornia company seeks to growqua
intePharma rice expressing two proteins from
animal genes, lysozyme and lactoferrinSad

make two human proteins, normally found in breast milk and tears, for use in treatihuman illnesses.

If it gets the necessary approvals, the decade-old company would become the first

USDA Agricultural Marketing Service has proposed amendments to the NOP to add fifte substances, along with any restrictive annotations, to the National List.

The fifteen substances are:

- * Use of Ferric Phosphate as slug or snail bait;
- ^{*} Use of Glycerine Oleate (Glycerol monooleate) as an anti-foaming agent (defoamer) in Pesticide Formulations;
- * Use of Tetrahydrofurfuryl alcohol in Passive Pheromone Dispensers;
- * Use of Hydrogen Chloride for Delinting of Cotton Seed -

The following substances may be used " ... as ingredients in or on processed products labeled as 'organic' or 'made with organic (specified ingredients or food group(s)):

Egg white lysozyme

- * L-malic acid
- * Microorganisms--any food grade bacteria, fungi, and other microorganism
- * Activated charcoal
- * Ammonium hydroxide
- * Cyclohexylamine as a boiler water additive for packaging sterilization. O.K. for products labeled 'made with organic (specified ingredients or food group(s));' prohibited in handling agricultural products labeled 'organic'
- * Diethylaminoethanol same as above
- * Octadecylamine same as above
- * Peracetic acid/Peroxyacetic acid used " ... in wash and/or rinse water as described abo
- * Sodium acid pyrophosphate used " ... as a leavening agent as described above
- * Tetrasodium pyrophosphate used "only in meat analog products as described above

- Planted soybeans in field previously used for testing transgenic corn.
- APHIS (USDA's Animal and Plant Health Inspection Service) discovered "volunteer" corn plants growing among soybeans. Instructed ProdiGene to remove the corn plants.
- Soybeans harvested before all the corn was removed, mixed with 500,000 bushels of soybeans.
- Soybeans destroyed, ProdiGene ordered to pay \$250,000 civil fines, reimbursement for lost crops, and \$1 million higher regulatory fees.

USDA tightens rules on Pharm/Industrial Cro

- Crop inspection 7 times; 5 in growing season,
 2 after harvest
- Field isolation distances increased
- Dedicated farm equipment required
- Permits required for industrial crops, like pharm crops

Groups fighting for the rights of peasant communities are stepping up pressure on governments

Should terminator seeds be used in certain cases?

For pharma crops to prevent outcrossing? Prevent outcrossing in areas of genetic diversity?

it," said Hope Shand of the Canada-based Action Group on Erosion, Technology, and Concentration (ETC Group).

If commercialized, activists said, Terminator would force farmers to return to the market for seeds every year, adding to their annual costs. This also would spell the end of locally adapted

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Why Doesn't FDA Have a Labeling Policy for GM Foods? Actually it does...

Foods produced through biotechnology are subject to the salabeling laws as all other foods and food ingredients

Information on label pertains to composition and attribution of food, not to agricultural or manufacturing practice

No label needed if food essentially equivalent in safety, composition and nutrition

GM food labeled if <u>different nutritional characteristics</u>, <u>ger</u> <u>material from known allergenic source</u> (*e.g.*, peanut, wheat or <u>elevated levels of antinutritional or toxic compounds</u>

Should fresh produce items, packages or displays be labeled to identify...? Summary of "yes" responses

Nutritional value77.1%Country of origin85.9%Chemicals used in production90.7%Organically grown86.0%Irradiated77.8%Use of biotechnology78.4%Use of waxes and/or coatings84.5%



Why not just label?

Putting a label on a whole food is relatively easy, but

GM FREE





Processed foods are different, tomato sauce that can use 8 or 1 different varieties – which wo require tracking that could be c

ucbiotech.or



But there are foods that are tracked for consumer choice... like organic and...







...Kosher

For which people pay premium prices



Should everyone a premiu price for free foods



What are some environmental issues?

- Gene flow via pollen flow to generate superwe (herbicide tolerance to wild/weedy species)
- Transfer of transgenes to non-GMO / organic c
- Loss of genetic diversity?
- Property rights (gene patents)?
- Spread of pharmaceutical genes into commer crops?



What are some environmental issues?

- Gene flow via pollen flow to generate superwe (herbicide tolerance to wild/weedy species)
- Transfer of transgenes to non-GMO / organic c
- Loss of genetic diversity?
- Property rights (gene patents)?
- Spread of pharmaceutical genes into commer crops?



Pollen Drift of GE Corn









Pollen Flow Distances for Crop Species of Interest

| Crop | Mode of Pollination | Means of | Fdn Seed Prod | Measure Pollen |
|-----------|-----------------------------------|---------------|--------------------|-------------------|
| Туре | | Movement | Isolation Distance | Movemnt Dstance |
| Alfalfa | Self-sterile; obligate | Bees | 900 ft | 2000 ft (0.48 mi) |
| | outcrossing | | (0.17 mi) | |
| Bentgrass | Clonal (stolons); type | Wind | 900 ft (98%purity) | 13.05 mi |
| | outcrossing dep on environment | | (0.17 mi) | |
| Canola | Predom. selfing; 30% | Wind/insects | >1320 ft | 1.9 mi |
| | outcrossing | | (0.25 mi) | |
| Corn | Almost exclusively | Wind | 660 ft | ~2 mi |
| | outcrossing | | (0.125 mi) | |
| Cotton | Predom. Seslfing; | Insects | >1320 ft | n.a. |
| | outcrossing with | | (0.25 mi) | |
| | insects | | | |
| Rice | Self-pollinating | Physical | 10 ft | 30 ft |
| | (99.5%); pollen viable | touching/wind | | |
| | 3-15 min | | | |
| Squash | Obligate outcrossing | Insects | 1320 ft | 0.8 mi |
| | | (predom. | (0.25 mi) | |
| | | bees) | | |
| Soybean | Self-pollinating (99%) | Physical | 5 ft | n.a. |
| | | touching/wind | | |
| Wheat | Self-pollinating | Physical | 5 ft | >160 ft |
| | (99.9%) | touching/wind | | |



Consequences of gene flow from GE crops to weedy species in fiel





non-GM canola

Question – What Are the Consequences of Gene Fl Consider Vitamin A Genes vs. Herbicide Toleran Genes from GE Rice to Weedy Red Rice





Pollen Flow between Herbicide-Tolerant Canola: Cause of Multiple Resistant Canola Variety



"Triple-resistant cane (Two GE traits; one mutati Hall et al. (2000)

Consequences of Triple-Resistant Canola and HT-Wild Hybrids?



What is the actual risk?

- HT doesn't necessarily translate in increase in weediness
- HT gene only helps plant if you sp target herbicide
- Eventually can't use specific herbicide

Who stands to lose?

- Herbicide manufacturer
- HT plant developer
- Farmer

What are some environmental issues?

- Gene flow via pollen flow to generate superwe (herbicide tolerance to wild/weedy species)
- Transfer of transgenes to organic crops?
- Loss of genetic diversity?
- Property rights (gene patents)?
- Spread of pharmaceutical genes into commer crops?



Will an organic farmer automatically lose accreditation if his/her crop is found contaminated with a GE crop?

No.

"As long as an organic operation has not used excluded methods and ta reasonable steps to avoid contact with the products of excluded methods detailed in their approved organic system plan, the unintentional preser of the products of excluded methods should not affect the status of a organic product or operation."





What are some environmental issues?

- Gene flow via pollen flow to generate superwe (herbicide tolerance to wild/weedy species)
- Transfer of transgenes to non-GMO/organic creation
- Loss of genetic diversity?
- Property rights (gene patents)?
- Spread of pharmaceutical genes into commer crops?





Genetic Modification Taints Corn in Mexico

SOURCE:New York Times, October 2, 2001





Gene flow in Mexican maize: consequences for genetic diversity



State of Jelisco



Near Amecameca in Chalco area

How does pollen and gene flow occur in Mexico?

Is this the first time gene flow has occurred into Mexican landraces?



What implications does transgene flow have for wild and domesticated maize?

Map of fields in Oaxaca, Mexico, where seeds wer collected from maize landraces in 2003 and 2004





SOURCE: Ortiz-Garcia et al. (2005) PNAS 102:12338-12343

Capital Press, September 16, 2005

Communicate to avoid pesticide drift, winemaker s

By MATEUSZ PERKOWSKI Freelance Writer

Fifteen years ago, David Adelsheim received some bad news. His vineyard manager had noticed that a section of his vineyard, located near Newberg, Ore., was producing vines with badly distorted leaves.

"Instead of being a full leaf shape, they might have been only half-aleaf shape, or they were smaller and fanned together," said Adelsheim. All the symptoms pointed to one thing: the plants had been damaged by an herbicide.

As it turned out, a neighbor had sprayed half an acre of his land that was overgrown with blackberry bushes with a growth regulator herbicide containing 2,4-D. Aside from killing the blackberries, some of the herbicide had drifted onto the rows of grapevines growing only 15 feet away.

Roughly five acres were affected by the drift, which was about a third of Adelsheim Vineyards at the time. The first several rows were the most badly damaged, but even grapevines 30 rows down were showing some deformation. Because the neighbor had sprayed in mid-spring – after the grape bud break but prior to bloom – much of the year's crop had been aborted, and the remaining vines were too damaged to ripen any grapes.

In the decade and a half since then, Adelsheim Vineyards has managed to overcome the injury caused by the incident – the company has expanded to 180 acres, and the five acres ravaged by the herbicide have largely recovered. Nonetheless, Adelsheim said the effects of the



MATEUSZ PERKOWSKI/For the Capital Press

David Adelseheim examines some grapes at his vineyards near Newberg, Ore. Fifteen years ago, herbicide drift damaged several acres of his grapevines, and Adelsheim said the affected plants have never fully recovered.



One of the most divisive issues regarding genetic engineerir is the thought that a choice must be made between EITHER "organic agriculture" OR "GMOs".

As long as these issues are polarized into "all is permitted" "nothing is permitted", rational social discussion is impossible.

Dualism (right versus wrong) makes compromise difficult

Co-existence

development of best management practices to minimize adventit presence of unwanted material and effectively enable differe production systems to co-exist to ensure sustainability an viability of all production systems.

General concept of co-existence is well-established in California conventional, organic and IPM systems working together.