

Contemporary Food Fights in California: Food and Environmental Safety Issues with GMOs



Peggy G. Lemaux
University of California, Berkeley



FOOD FIGHTS IN CALIFORNIA

County GMO Ordinances



IT ALL STARTED IN
MENDOCINO
COUNTY



**March 2004 MENDOCINO
MEASURE H -2,579 signatures obtained**

- “unlawful for any person, firm, or corporation to propagate, cultivate, raise, or grow genetically modified organisms in Mendocino County” (excludes microorganisms)
- “DNA or deoxyribonucleic acid means a complex protein 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 in Mendocino County.

...entist argument
...audacious

In our opinion
Remember there are two sides to every story.

To the Editor:
The comparison in the article regarding the safety of organic and GMO crops is misleading. Organic crops are not genetically modified. GMO crops are. The article is biased and does not provide a fair comparison. I am a farmer and I know the difference. Organic crops are grown with natural methods, while GMO crops are grown with genetic engineering. The article is a disservice to the organic farming community.

We endorse Measure H!



CRAIG BELL

YES
on the ballot

Mendocino considers ban of genetically engineered plants

NORTH COAST

The Mendocino County Board of Supervisors is considering a measure to ban the sale and distribution of genetically modified organisms (GMOs) in the county. The measure, known as Measure H, would require the state to ban the sale and distribution of GMOs in the county. The board is expected to vote on the measure in the next few weeks.

Letters to the Editor, Flyers, Mailings Were Everywhere...

GM

By GLENDA
The Daily Journal

County supervisors on Tuesday unanimously voted to place on the March ballot an initiative that would prohibit the growing of genetically modified organisms in Mendocino County. The initiative is only one of several measures for further study because signatures were turned in enough names to qualify for the ballot.



TONY CRAVER

■ Protect our health!

What were they writing about?

More on GMO

To the Editor:
I've been reading with interest the arguments in support of banning genetically modified organisms in Mendocino County. The arguments lack a scientific basis and are of little value. We all know that by cross-pollination, the genetic material of one plant can be transferred to another. This is a natural process that has been occurring for thousands of years. The only difference between natural cross-pollination and genetic engineering is that genetic engineering allows for the transfer of genes between different species. This is a natural process that has been occurring for thousands of years. The only difference between natural cross-pollination and genetic engineering is that genetic engineering allows for the transfer of genes between different species. This is a natural process that has been occurring for thousands of years.



TONY CRAVER

- Protect our environment!
- Protect our private property!

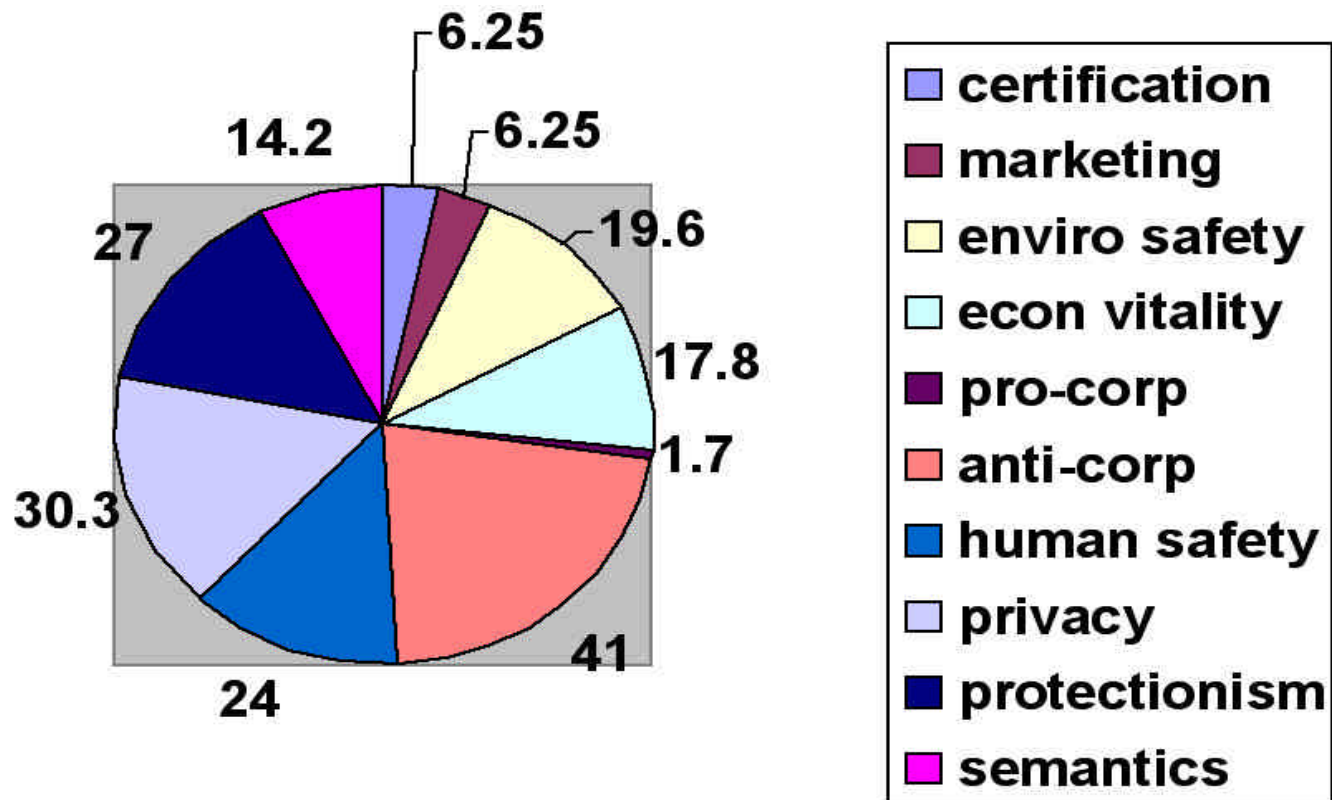
Keep Mendocino County GMO FREE!

Join us!

...this band of
...includes the
...engineering of food
...they just happen to be
...of the herbicides
...high their patented GMO
...to use exclusively.
...to note a November
...the Northwest Science
...the Policy Center in
...concludes that the
...of GM corn, soybeans
...increased pesticide use (herbicides
(emphasis is mine).
So I ask you, dear reader, what
interest might the CPMA have in
Mendocino County initiative?



CHARACTERIZATION OF MEASURE H ELECTION RELATED MATERIALS IN MENDOCINO COUNTY



Giusti *et al.* (2004) Focus on Genetically Engineered Crops and Foods - A Case Study from Mendocino County's Public Debate.

The discourse was driven in many cases by alarming assertions and facts that are 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 intravenously because he had lost the ability to eat or drink. The longer he received the lipids, the higher the dose of chemo. When I asked why, I was told that the soybeans used were genetically modified to be “Round Up Ready,” they were putting food into my son’s veins that could withstand the chemicals they were using to kill the leukemia blood cells, making the chemo less effective. In order to keep my son alive nutritionally, the higher doses of chemo almost took him away ”

Jenny Shattuck-Hale, Ukiah Daily Journal, 2/20/04



**DISCOURSE MOVED TO
OTHER COUNTIES**

**... THAT ARE MORE
AGRICULTURALLY
ORIENTED**



November 2004, Butte
Ballot initiative – 9,649 signatures

“Nothing in this Ordinance shall make it unlawful for (1) a fully accredited college or university to engage in scientific research or education using genetically engineered organisms under secure, enclosed laboratory conditions, taking precautions to prevent contamination of the outside environment, or (2) any licensed health care practitioner to provide any diagnosis, care or treatment to any patient”

Upon final determination that there has been a violation of this Ordinance, the Commissioner shall immediately thereafter cause to be confiscated for the public safety

“Upon final determination there was a violation of this Ordinance, the Commissioner shall thereafter cause to be confiscated for the public safety any such organisms...

effects which might result from the violation.”

**EXCERPTS FROM ORGANIC CONSUMERS ASSOCIATION
LETTER DISSEMINATED BEFORE NOV. 2 ELECTION**

Dear Friends,

While the rest of the country focuses on one presidential candidate or another, Measure D represents Biodemocracy in action. Rarely do we have the opportunity to change the

Contamination is spreading so quickly that we have little time to waste before our entire food supply is lost forever...

statewide ban on GE crops. California's future is organic!

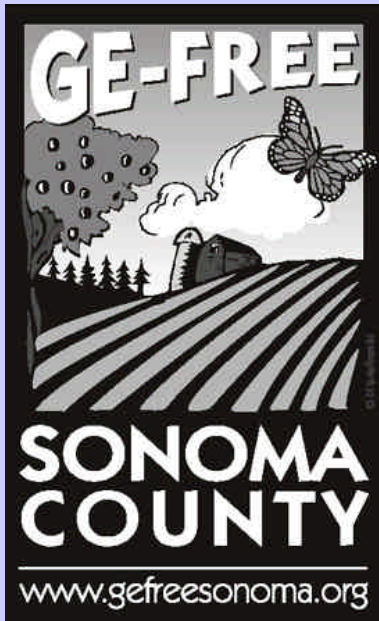
Yours in organics,

Organic Consumers Association

www.organicconsumers.org

WHY DO WE NEED TO PASS THIS “GE-FREE” INITIATIVE

A “GE Free Sonoma County” will be good for our farmers, good for our environment, good for business, good for public health, and good for our democracy!



We need to protect the right to farm. Those farmers who choose to farm without GE crop varieties must have the right to do so...

livestock or fish will lose access to important international markets. We also want to

We need to protect our...environmental, public health and economic future...until there is public, peer-reviewed science available, with multigenerational studies on all the long-term impacts of these very new technologies...

We need to protect the public health of the people of Sonoma County... Such exposure could occur through GE pollen inhaled or plants eaten, or by increased exposure to toxic herbicides and pesticides used to kill the new “super weeds” and “super bugs”...



ELECTION RESULTS

MEASURE H MENDOCINO

NO 43%

YES 57%

MEASURE B MARIN

NO 39%

YES 61%

MEASURE D BUTTE

NO 61%

YES 39%

MEASURE M HUMBOLDT

NO 65%

YES 35%

MEASURE Q SAN LUIS OBISPO

NO 59%

YES 41%

SONOMA COUNTY ORDINANCE

Qualified for November 2005 Ballot

needed 40,000 signatures

Section 4. Prohibitions.

(a) It is unlawful for any person to engage in the propagation, cultivation, raising, growing, sale or distribution of transgenic organisms in Sonoma County.

(b) It is unlawful for any corporation or other legal entity to engage in the propagation, cultivation, raising, growing, sale or distribution of transgenic organisms in Sonoma County.

(c) Any act in violation of paragraph (a) or (b) of Section 4 of this Ordinance is declared to constitute an imminent endangerment of agricultural health and environmental health and as such is declared a public nuisance.

(d) It is beyond the authority of the governments of the United States or the State of California, or any of their agencies, to deny the right of the people of Sonoma County to prevent Agricultural and Environmental contamination from transgenic organisms.

(b) Nothing in this Ordinance shall make it unlawful for state or federally licensed medical or agricultural research institutions, medical or agricultural laboratories or medical or agricultural manufacturing facilities in Sonoma County to conduct licensed medical or agricultural research or production involving transgenic organisms whose reproduction in the environment can be physically contained (following USDA protocols and guidelines at the **BSL-3-Ag containment level or greater** as outlined in USDA Departmental Manual No. 9610-001).

Animal Biotechnology and Genomics Education



Feeding the Future

www.feedingthefuture.org

Dear Friend of California's Family Farmer,

While the fundamentals of farming are well known, the actual practice

...special interest groups - professing to have the best interests of family farmers at heart - are challenging the innovation that has made California farmers the leaders in progressive agriculture.

As farmers, we understand that some people are unsure of

As farmers, we understand that some people are unsure of biotechnology...Some activists, however, utilize scare tactics in an effort to ban biotechnology and deny everyone the benefits of the best science and the most extensive research in the world today.

making our planting decisions. We are confident in the future of

Family farmers want to continue to utilize scientific expertise when making our planting decisions. We are confident in the future of biotechnology and support the regulatory process that approves these crops on a case-by-case basis.

BILL PAULI
President
California Farm Bureau Federation



November 2004, Fresno

Passed: Board of Supervisors 5 For; 0 Against

- Whereas, biotechnology has the potential to greatly improve the health, nutrition and

County of Fresno affirms the right for farmers and ranchers to choose to utilize the widest range of technologies available to produce a safe, healthy, abundant and affordable food supply, and that the safe, federally regulated use of biotechnology is a promising component of progressive agricultural production.

and ranchers to choose to utilize the widest range of technologies available to produce a safe, healthy, abundant and affordable food supply, and that the safe, federally regulated use of biotechnology is a promising component of progressive agricultural production.







**Georgia
General Assembly**

May 9, 2005 - Senate Date Signed by Governor

05

LC 25 3839

Senate Bill 87

Pre-emptive Seed Laws passed in 14 states – pending in CA

provide certain exemptions; to repeal conflicting laws; and for other purposes.

**No county...shall adopt or continue in effect
any ordinance, rule, regulation or resolution
regulating the labeling, packaging, sale,
storage, transportation, distribution,
notification of use or use of seeds...**

notification of use, or use of seeds.

(b) This Code section shall in no way prohibit or impair the legal right of any county, municipal corporation, consolidated government, or other political subdivision of this state to issue business licenses or to make zoning decisions."

SECTION 2.

All laws and parts of laws in conflict with this Act are repealed.





Genetically engineered foods or GMOs



Classical Breeding

compared to

Genetic Engineering

Uses plant machinery in plant

Gene exchange is random
involving entire genome

When/where genes expressed
not controlled by breeder

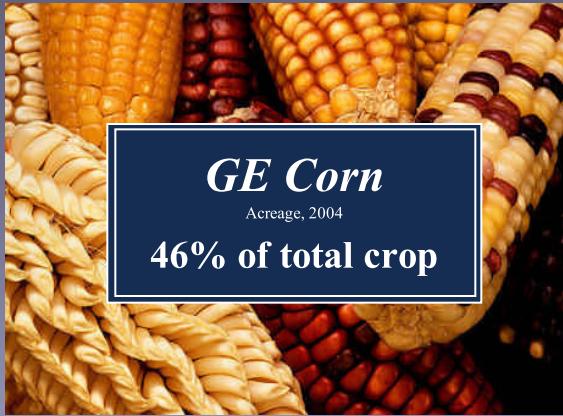
Only between closely related or
within species

Uses plant machinery in laboratory

Gene exchange is specific,
single or a few genes

When/where gene expressed
can be controlled precisely

Source of gene from any
organism



GE Corn

Acreage, 2004

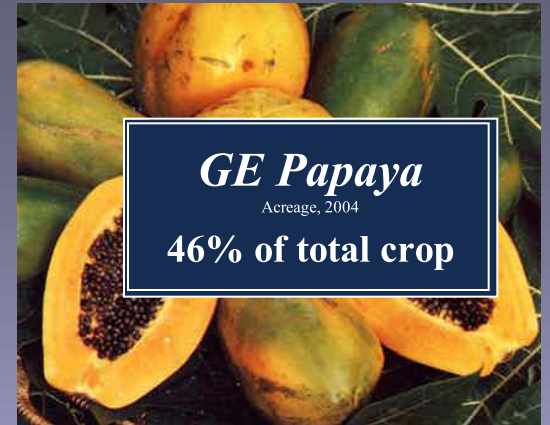
46% of total crop



GE Canola

Acreage, 2002

75% of total crop



GE Papaya

Acreage, 2004

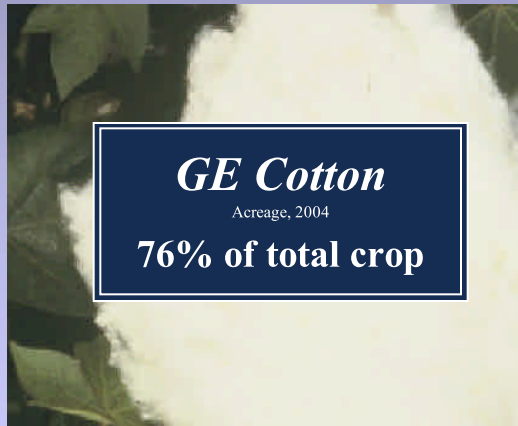
46% of total crop



GE Soybean

Acreage, 2004

82% of total crop



GE Cotton

Acreage, 2004

76% of total crop



GE Squash

Acreage, 2004

19% of total crop

SOURCE: NCFAP; USDA, USA Today



Estimated 75% of Processed Foods Contain GE ingredient



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

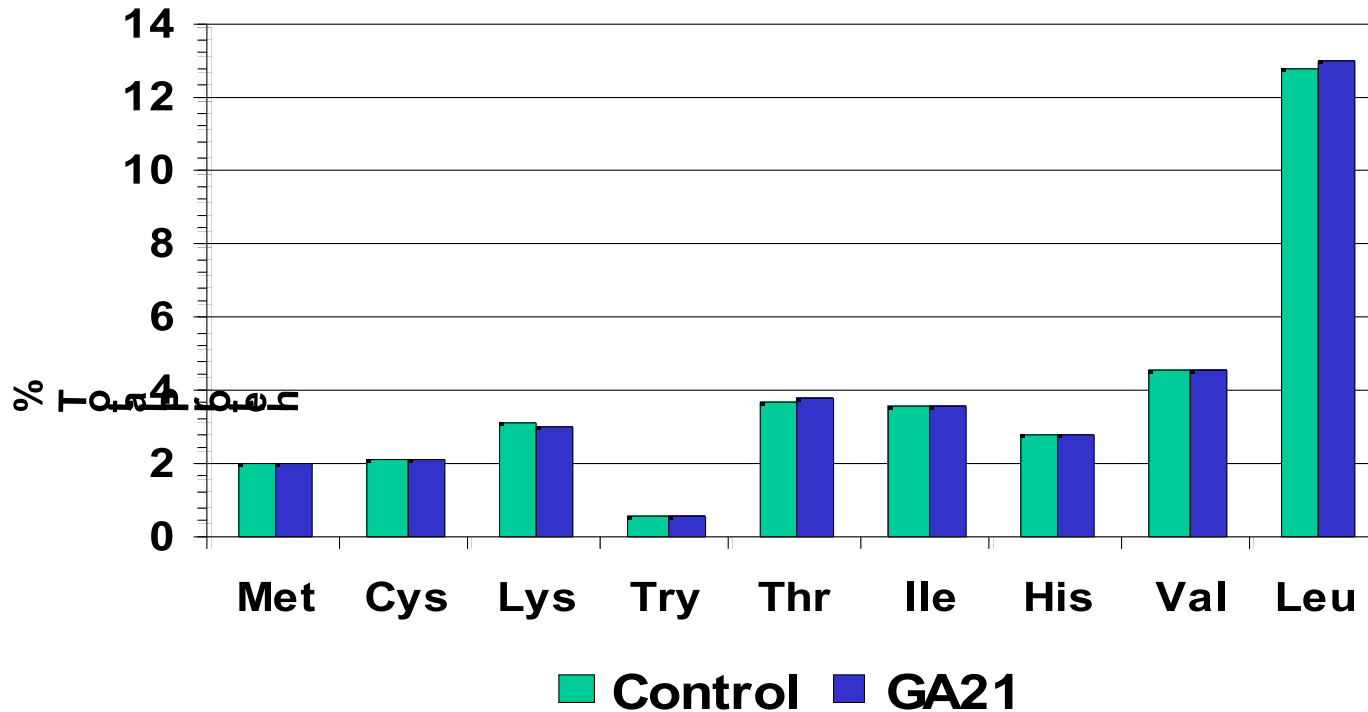
GE Foods and Crops: Unregulated?

USDA

EPA

- ◆ Field testing
 - permits
 - notifications
- ◆ Food safety
- ◆ Feed safety
- ◆ Determination of non-regulated status
- ◆ Herbicide registration

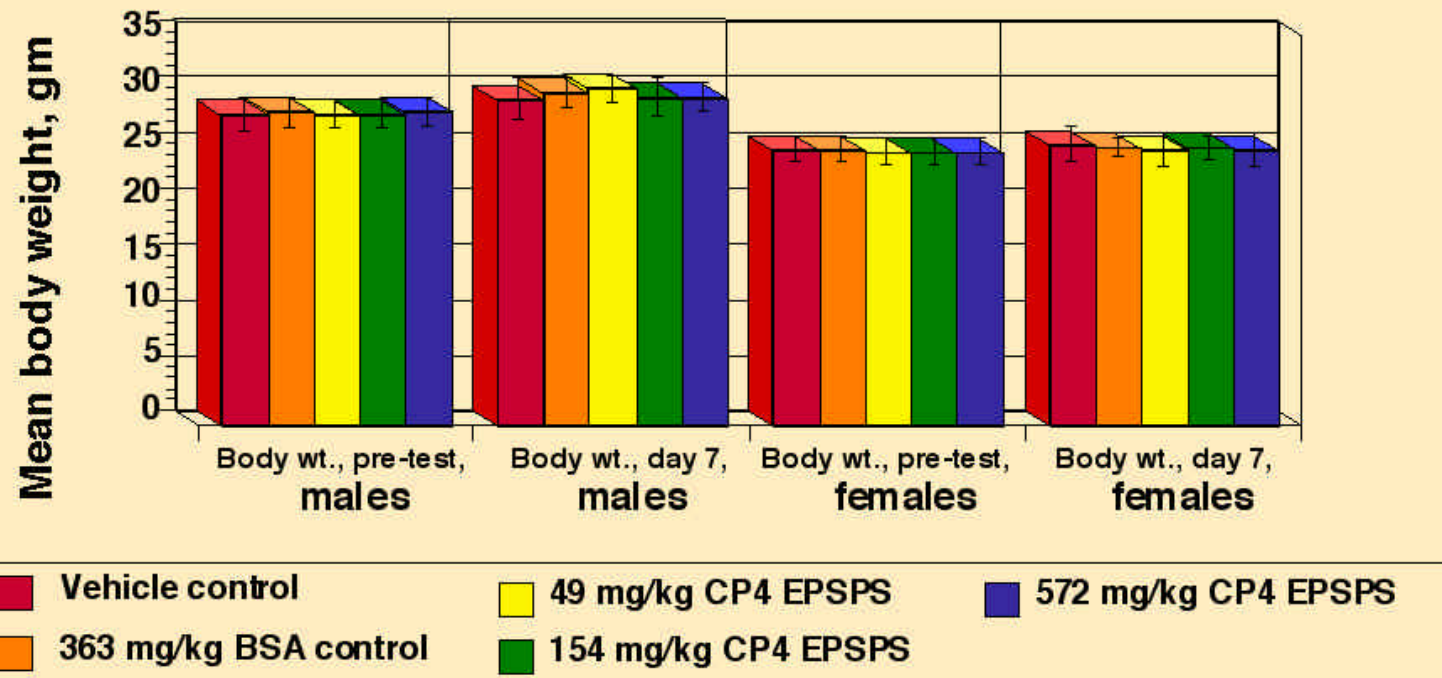
Compositional Equivalence: Amino Acids



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

Toxicity Assessment: Roundup Ready/CP4 EPSPS protein

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



Nonexhaustive List of Issues with GMO Foods

- *Food Safety*
- *Environmental*
- *Socioeconomical/Ethical*

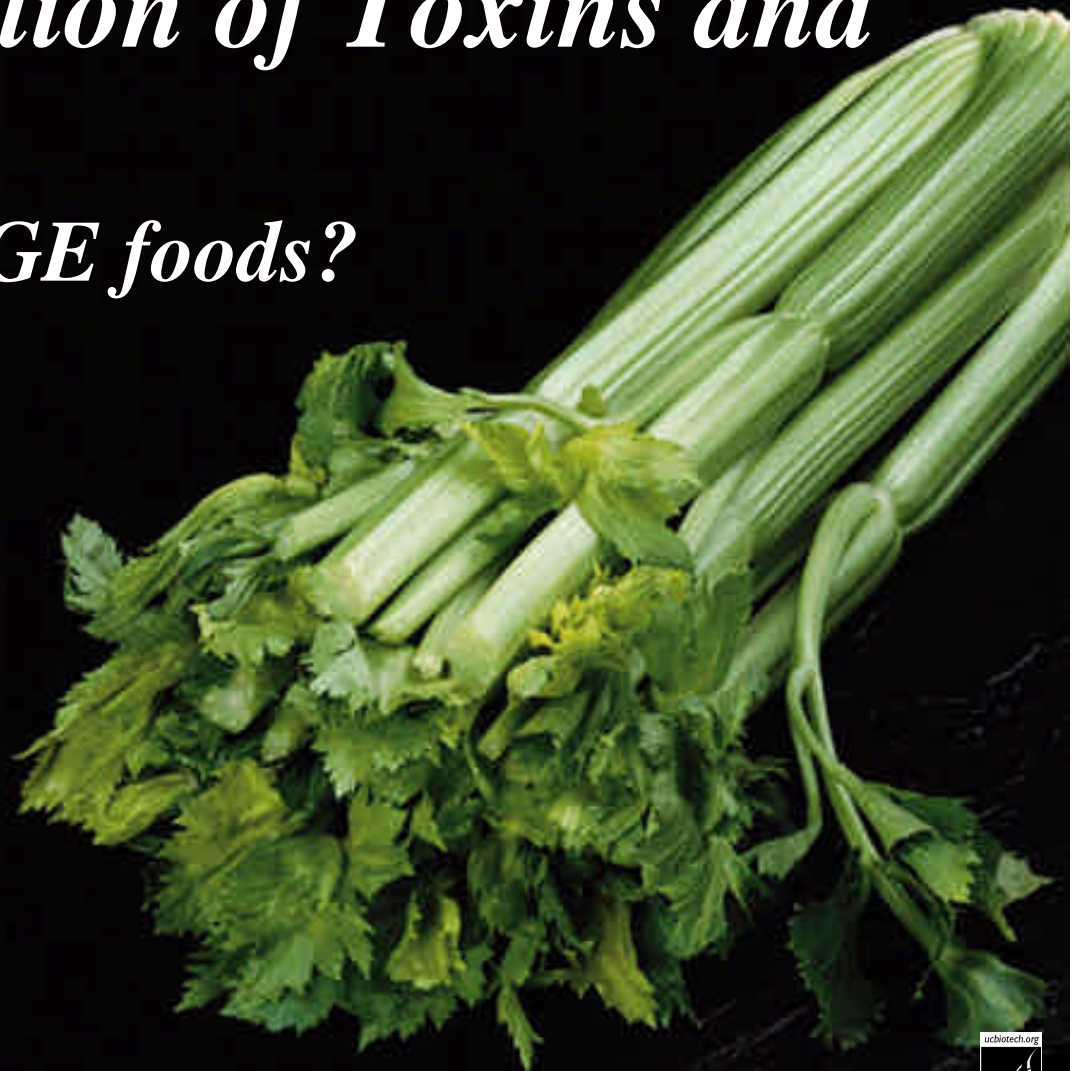
Nonexhaustive List of Issues with GMO Foods

Food Safety Issues

- Create new allergens
 - Activate naturally occurring toxins or create new ones
 - Removal of existing allergens and antinutritionals
- Adversely affect the nutritional quality of foods
 - Enhance the nutritional quality of foods
- Vegetarian and religious issues with GMOs
 - Labeling
 - Increased antibiotic resistance in intestinal flora
 - Horizontal transfer of DNA from plants to humans through foods
 - Unknown, unanticipated risks from GMO consumption
 - Trust in regulatory agencies

Inadvertent Creation of Toxins and Allergens

Does this just apply to GE foods?



Classically bred foods cause allergies

Kiwi Allergies



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



Nonexhaustive List of Issues with GMO Foods

Environmental Issues

- Unintended adverse consequences for beneficial insects
 - Unintended beneficial consequences for beneficial insects
- Soil residuals of bio-engineered pesticides
 - Soil residuals of nonengineered pesticides used in the absence of engineered varieties
- Degradation of the environment because of GMOs, *e.g.*, residuals, chemical dependence
 - Degradation of the environment because of current agricultural practices, *e.g.*, tilling, fertilizers, pesticides
 - Improved environmental situation with GMOs, *e.g.*, reduced phytic acid, phyto and bioremediation
- Herbicide-resistant weeds as a result of GMOs, “superweeds”
 - Herbicide-resistant weeds from conventional practices in absence of GMOs

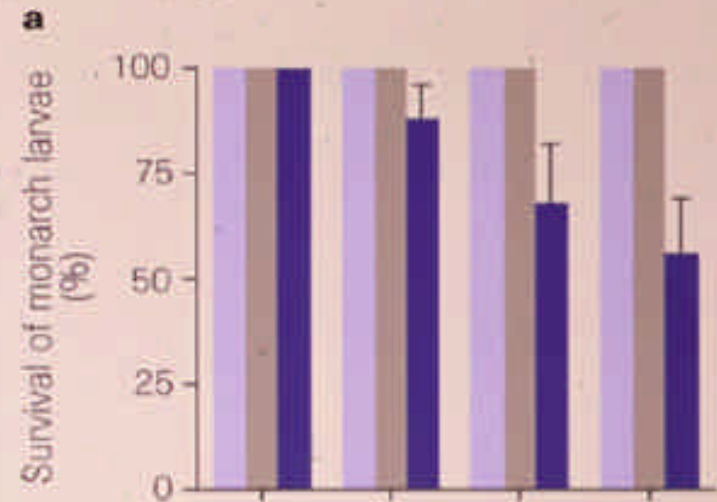
Effect on Bystanders?

- Monarch butterfly study

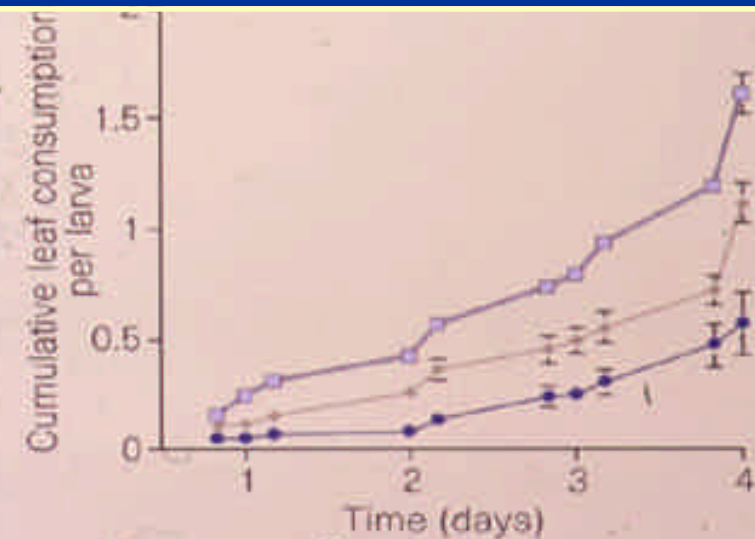


Losey et al. 1999

- Criticisms:
 - pollen dosage?
 - lab study



B.t. negative effect on unintended insect?






September 8, 2001

Data on Genetically Modified Corn Reports Say Threat to Monarch Butterflies Is 'Negligible'

By ANDREW POLLACK

Genetically modified corn poses a "negligible" risk to monarch butterflies, according to a package of six papers that will soon be published in a scientific journal. The papers, the most comprehensive peer-reviewed publications on this issue, could lay to rest one of the biggest controversies over genetically modified crops.

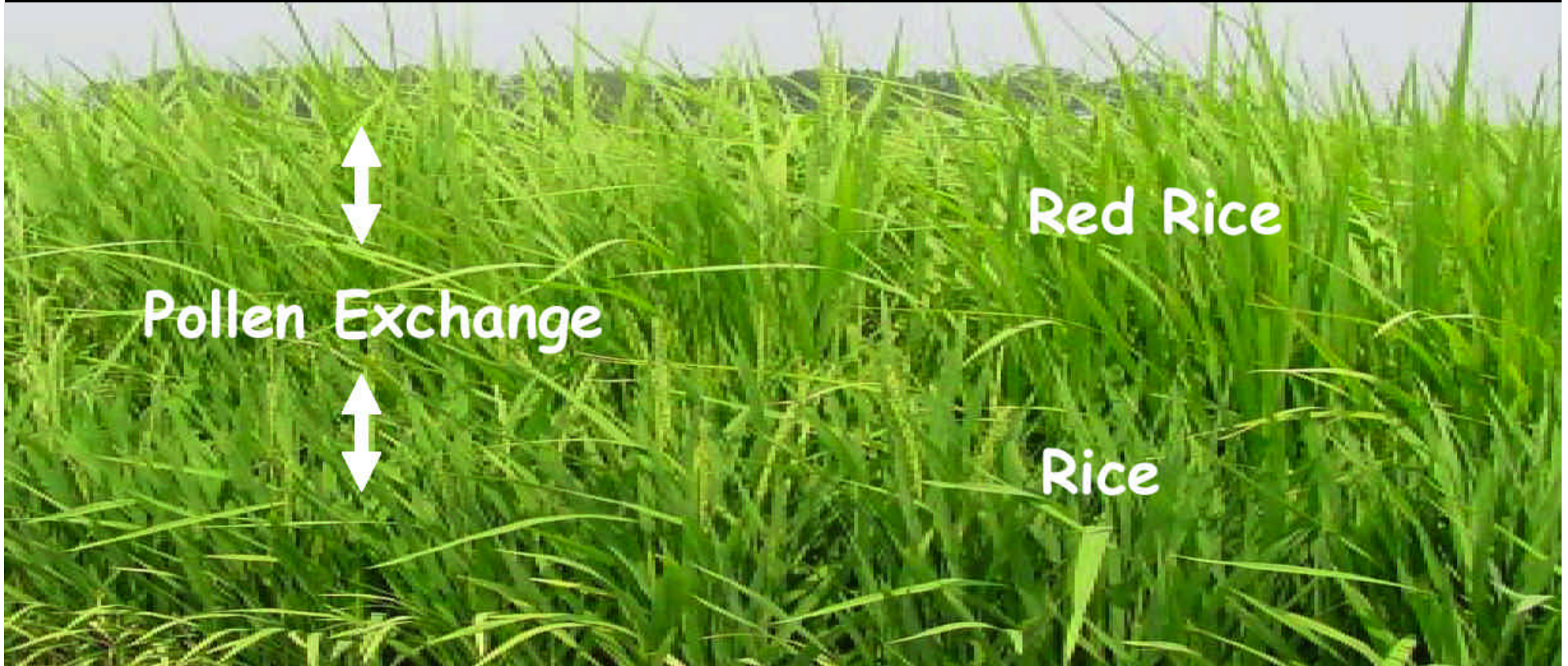


*Parasitoid wasp of canola pest not affected by *B.t. canola*, making it ecologically superior to conventional insecticides that kill the wasp.*

SOURCE: Poppy et al., 1999. Parasitoid behaviour and Bt plants. *Nature* 400: 825.

B.t. – positive effect on unintended pest?

*Movement of Genes from Crop Species to Wild, Weedy Species
e.g., Commercial Rice to Weedy Red Rice*



ISSUES WITH PHARMA CROPS



PRODIGENE



- Planted soybeans in field previously used for transgenic corn.
- USDA discovered "volunteer" corn plants growing among soybeans. Instructed ProdiGene to remove corn plants.
- Soybeans harvested before all corn was removed, mixed with 500,000 bushels of soybeans.
- Soybeans destroyed, ProdiGene paid \$250,000 civil fines, reimbursement for lost crops; \$1 million higher regulatory fees.

Consequences of Gene Flow on Genetic Diversity: Transgenes in Mexican Landraces



How did pollen and gene flow occur in Mexico?

Is this the first time gene flow into Mexican, maize landraces happened?

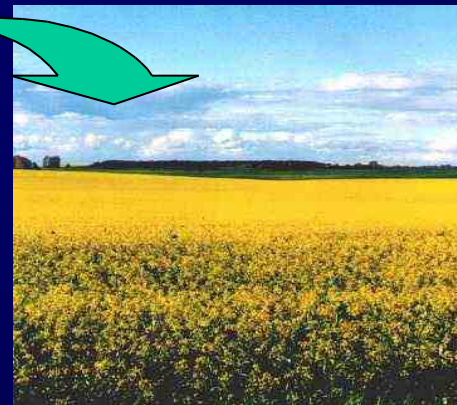


What implications does transgene flow have for wild and domesticated maize?

*Consequences of pollen spread
from GE crops to organic crops in the field*



GM canola



non-GM canola



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 takes reasonable steps to avoid contact with the products of excluded methods, as detailed in their approved organic system plan, the unintentional presence of the products of excluded methods should not affect the status of an organic product or operation.”

SOURCE: AMS National Organic Program Q&A



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The website, a part of the University of California Division of Agricultural and Natural Resources Statewide Biotechnology Workgroup, provides science-based information to the public on issues relating to the application of biotechnology to crops. For the scientific community, educational needs and an extensive database of pertinent scientific literature are available to promote participation in the dialogue. Teaching aids for students and teachers are provided.



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BIOTECHNOLOGY INFORMATION

ucbiotech.org
Plant Biotechnology Group

In-depth understanding of biotechnology and its issues is a necessary factor in informed dialogue and making wise decisions about the use of this technology and its products. This section has commonly raised issues associated with a variety of topics relating to biotechnology and agriculture. The issues are paired with responses, which contain links to relevant scientific references. The content of the Issues and Responses section and the choice of literature cited is the sole responsibility of Peggy G. Lemaux and Petra Frey at the University of California, Berkeley, in collaboration with the Plant Biotechnology Group, ETH, Zurich, Switzerland and Dr. Alan McHughen, Cooperative Extension Specialist, University of California, Riverside.

Choose a search category: Search

Search for a word or phrase: Search

The following are the results of your text search for "monarch butterfly"

- [Do Bt plants affect beneficial insects?](#)
- [How does Bt corn affect nontarget insects like the monarch butterfly?](#)
- [What are the impacts of genetically modified crops on the environment?](#)
- [What do scientific studies indicate about the hazard of Bt corn to monarch butterflies?](#)

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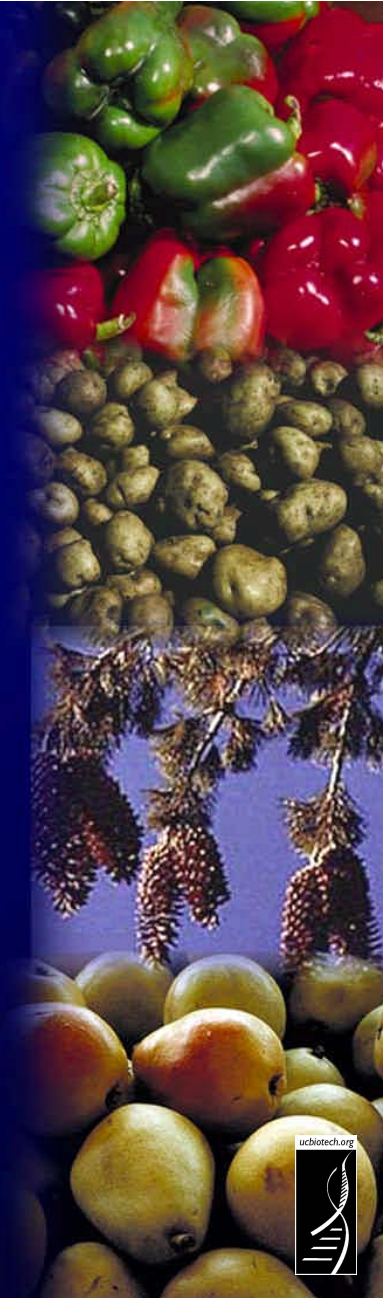
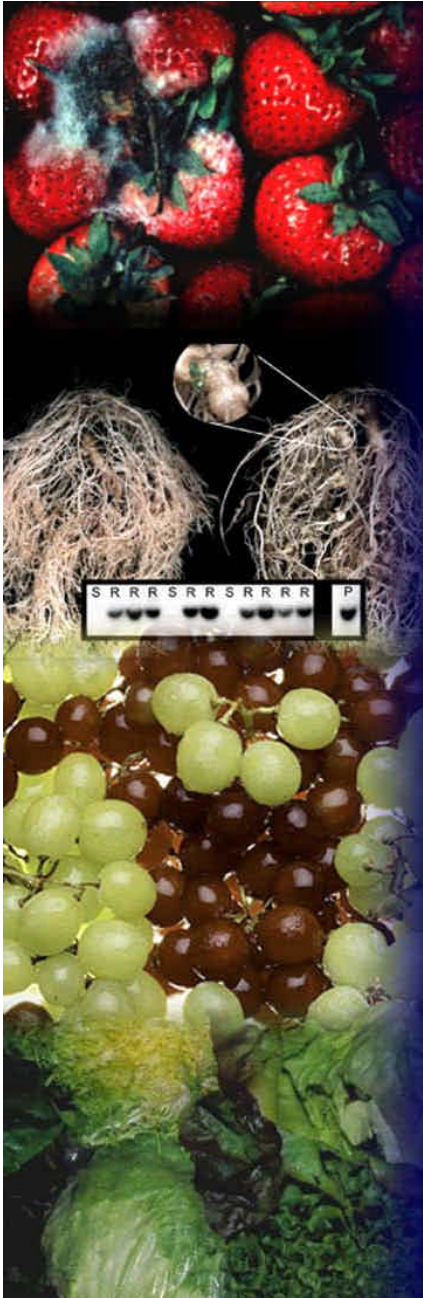
Do Bt plants affect beneficial insects?

The effect of Bt plants on non-target insects has been studied using a broad range of different insects, both in the laboratory and in the field. In one of these studies Bt176 corn pollen and a control corn pollen were fed to lady beetle larvae, where 69% of the larvae survived on Bt pollen and 61% of the larvae survived on the control pollen [Pilcher, 1997]. Another group tested the effect of Bt 176 corn on aphids feeding on leaves and the effect this would have on their natural predators, the green lacewings. They could not find any significant effect of the Bt corn on aphid larvae development or green lacewing mortality [Lozza, 1998]. A further study tested the predation and parasitism of the European corn borer, using the same Bt176 corn variety, in the field. Also in this case, the predation and parasitism was the same on Bt and on non-Bt corn [Orr, 1997]. No significant negative effect of the Bt corn could be found in any of these studies. The results of two recent studies, however, showed that monarch butterfly larvae could be adversely affected by pollen from certain varieties of Bt corn (Bt 11 [Losey, 1999] and Bt176 [Hansen Jesse, 2000]). These laboratory studies demonstrated that monarch larvae were more likely to die when fed milkweed leaves dusted with pollen from Bt corn than when fed leaves dusted with pollen from conventional corn. Both of these laboratory studies used Bt pollen at very high concentrations that are not encountered beyond the edge of a field [Betz, 2000]. An analysis of the results from a field-study of effects on swallowtail larvae, where mostly lower pollen



Sample of possible engineered fruits and vegetables

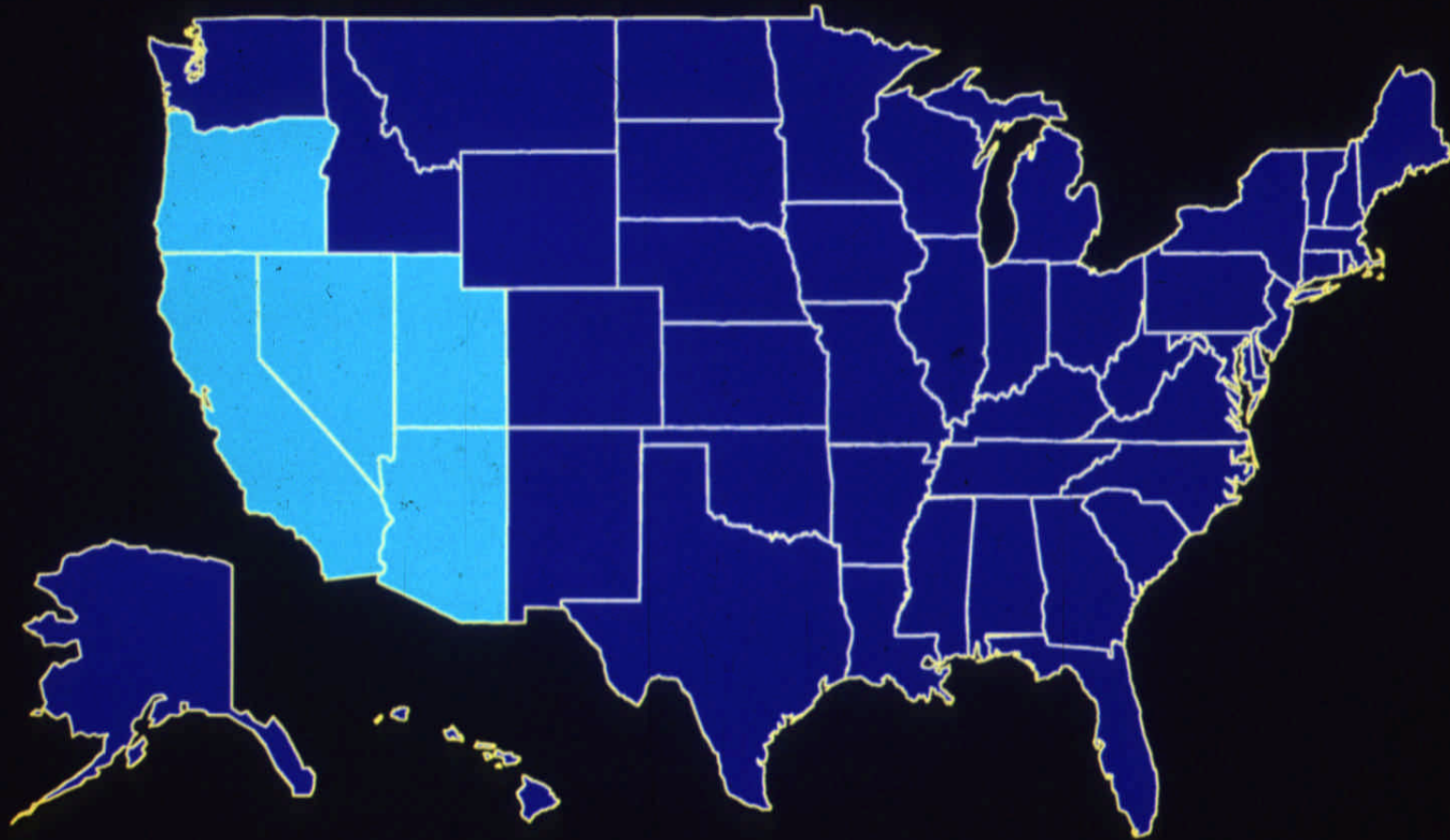
- Strawberries resistant to molds
- Tomatoes not attacked by root nematodes
- Grapes resistant to Pierce's Disease
- Drought tolerant lettuce
- Peppers resistant to bacterial diseases
- Potatoes no longer susceptible to blight
- Sugar pine resistant to white pine blister rust
- Frost-tolerant pears





Modern Corn and Ancient Teosinte Relative

U.S. Cultivated Land



■ 1987 Acreage

ELECTION RESULTS

MEASURE H MENDOCINO

NO 43%

YES 57%

MEASURE B MARIN

NO 39%

YES 61%

MEASURE D BUTTE

NO 61%

YES 39%

MEASURE M HUMBOLDT

NO 65%

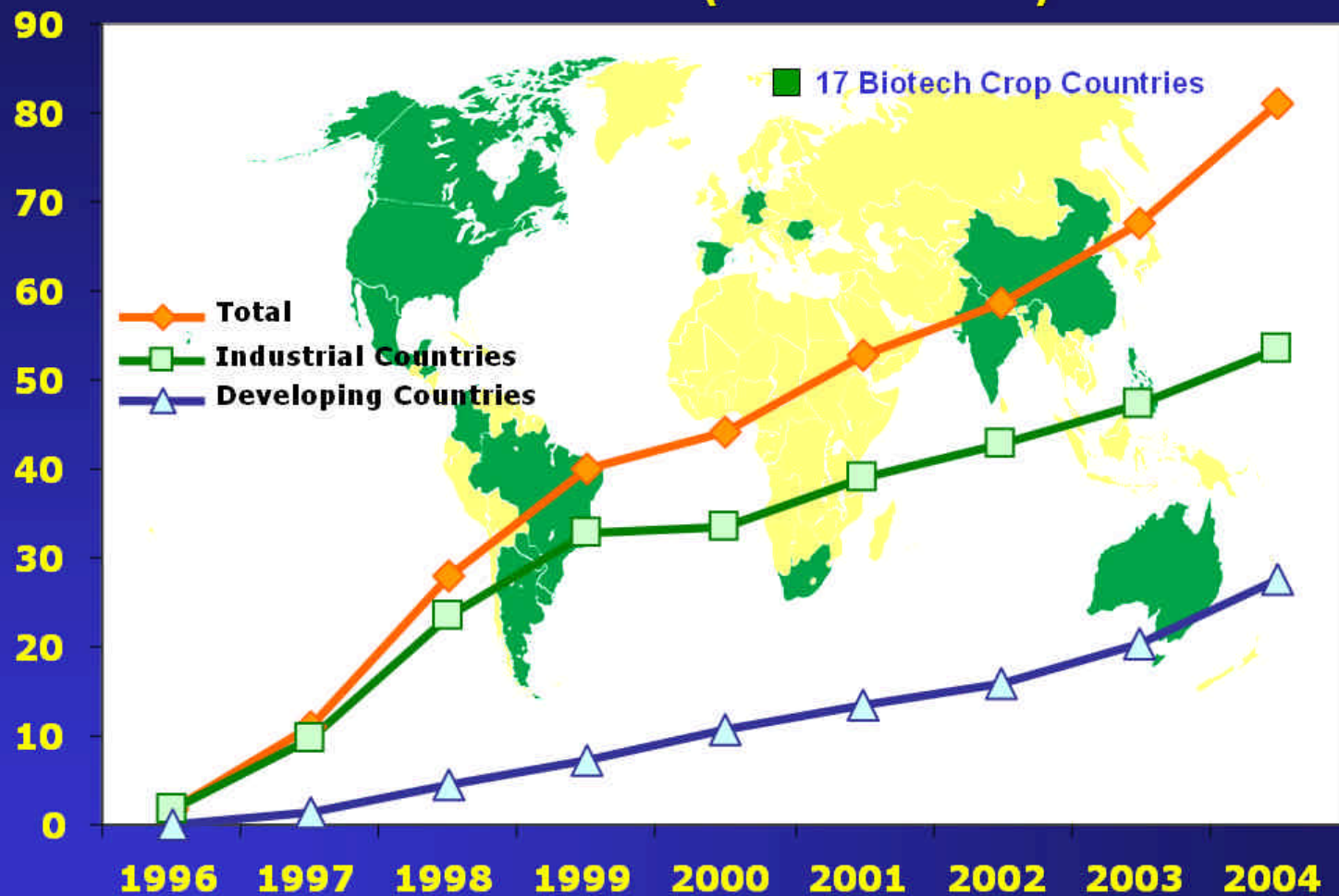
YES 35%

MEASURE Q SAN LUIS OBISPO

NO 59%

YES 41%

Global Area of Biotech Crops Million Hectares (1996 to 2004)



Increase of 20%, 13.3 million hectares or 32.9 million acres between 2003 and 2004

Source: Clive James, 2004





Main Menu

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Sales Information-Genetic Engineering in California Agriculture



Peer-Reviewed Educational Video

Production Team

your credit card information.

A 30-minute, peer-reviewed video explaining the science behind genetic engineering, its uses in food crops and animals, where and why the technology is being used by California farmers, and some of the science-based concerns pertaining to the use of genetic engineering.

If you want to view the movie

mms://STREAM.ucanr.org/Windows Media/UCTV_04_06.asf


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Educational Displays for City, County and State Events





PUBLICATION 8153

UNIVERSITY OF CALIFORNIA
Division of Agriculture
and Natural Resources
<http://anrcatalog.ucdavis.edu>



Genetic Engineering and Pollen Flow

NORMAN C. ELLSTRAND, PH.D., Professor of Genetics and Director,
Biotechnology Impacts Center, University of California, Riverside

INTRODUCTION

Pollen grains are the vehicles that transport a plant's male cells or gametes. For most plants that produce pollen, it is transported by wind and insects plus many species are able to self-pollinate some or most of their own female cells or eggs. Typically, the

Science-based, Peer-reviewed FACT Sheets on the Issues

What are the consequences when traditionally bred crops cross with wild relatives?

The vast majority of the attention has focused on engineered crop genes in natural populations. For guidance about future problems with engineered crops, we can ask whether traditionally improved crops have hybridized with wild relatives, and if so, whether those hybrids have caused any problems. Most cultivated species naturally hybridize with some wild relative or relatives somewhere in the world (Ellstrand 2003a). In some cases, such as coffee, those wild relatives are geographically restricted. On the other hand, one or more wild relatives of rice are usually found where rice is cultivated worldwide. The vast majority of cases involving hybridization of cultivated plants and their wild relatives has been of little consequence. However, such hybridization, on occasion, has created two classes of problems:

The evolution of new or more difficult-to-control weeds. In particular, the evolution of a new weed beet in Europe – a hybrid of sugar beet and an innocuous wild species - has resulted in well over a billion dollars of damage to Europe's sugar industry in terms of reduced yields and increased management costs (Ellstrand 2003a). In California, hybridization between rye and a wild relative has been implicated in the evolution of a new weedy rye variety that has hurt the wheat and rye industry in the northeastern part of that state (National Research Council 1989).



Grapes are grapes, or are they?

Another Voice
BY PEGGY LEMAUX

Editor's note: the following introduction by John Harper of the UC Cooperative Service explains this column.

John Harper: In light of the letter concerning Measure H, reading the letter to the editor, and the questions we've been getting at the UC Cooperative Extension office, local farm advisors, including myself, Glenn McGourty and Greg Giusti, have been collaborating with several of our extension biotechnology specialists at three of the UC campuses. Those specialists are Peggy Alan McHughen and Alison Van Eenennaam. In our discussions we have been neutral on the issue. We also

would cross pollen (male cell) variety with eggs (female cell) variety and select a new variety. What happens when you just combine them to make No, genetic rules say only each parent is lost. The control which recipes in the best. This method

Animal biotechnology

Editor's note: This is the second in a series of articles on biotechnology provided by the Utah UC Cooperative Extension Service Farm Adviser's office. The author of this article is Alison Van Eenennaam, Ph.D., UC Davis.

A recent study of public knowledge about biotechnology, genetic engineering, and genetic modification by Rutgers University found that the majority of Americans claim to know "very little" (55 percent) or "nothing at all" (22 percent) about biotechnology. This knowledge gap and related discomfort is particularly apparent in the case of animal biotechnology. This is evidenced by the fact that in this same survey the majority of people stating that they knew "nothing at all" also animal biotechnology, also disapproved of its use.

Animal biotechnology encompasses a broad range of technologies including the widely used artificial

Another voice BY ALISON VAN EENENNAAM

and aquatic organisms. Senate Bill 245 "bans aquaculture of salmon, exotic (non-native) and transgenic (genetically-engineered) fish in state waters, including the ocean from 0.3 miles offshore." Put simply, existing regulations already ban GE aquatic animals (e.g. fish, shrimp) from state rivers and streams. Additionally, California Department of Fish and Game regulations require the possession of a permit to raise GE fish in contained onshore systems in California. To date several permits have been granted to medical and scientific research laboratories that conform to strict guidelines designed to prevent the escape of GE fish into the waters of the state.

Federally, the FDA determined not to regulate GloFish because zebrafish

of animals for any purpose. others are concerned with the production of GE animals, and yet others specifically concerned with the use of GE animal food. Reasons for this position include varying personal beliefs, animal welfare, food safety, mental, and ethical concerns.

Although biotechnology has created a glowing market, it has potential to be more vital so. For example, in our body, GE pigs are the organizations being

Questions on Measure H

Another voice BY ALAN MCHUGHEN

Waters in Mendocino are being asked to ban "GMOs" - genetically modified organisms - from being grown in the County. The local media has given considerable coverage to supporters on both sides, but is that enough to provide for an informed, truly democratic decision? Although an "out-of-towner," I am concerned for the state of democracy in all California counties. As a public scientist supported entirely by taxpayers, I conclude that Mendocino taxpayers simply have not been given enough clear and accurate information to make an informed decision, whether for or against Measure H.

Too many crucial questions remain unanswered. What exactly will be banned and what will be allowed? The legal wording is disappointing and what will be allowed? I think the measure will ban seedless grapes, broccoflowers, potatoes and other products of modern plant breeding. Some think it will ban any plants or animals produced using genetic engineering techniques. Others think it will ban transgenic genes from different species. Almost all of the initiative, all of these groups. Yet, according to a survey done where the majority are voting on? Quite apart from the supporters have in mind. As well, not

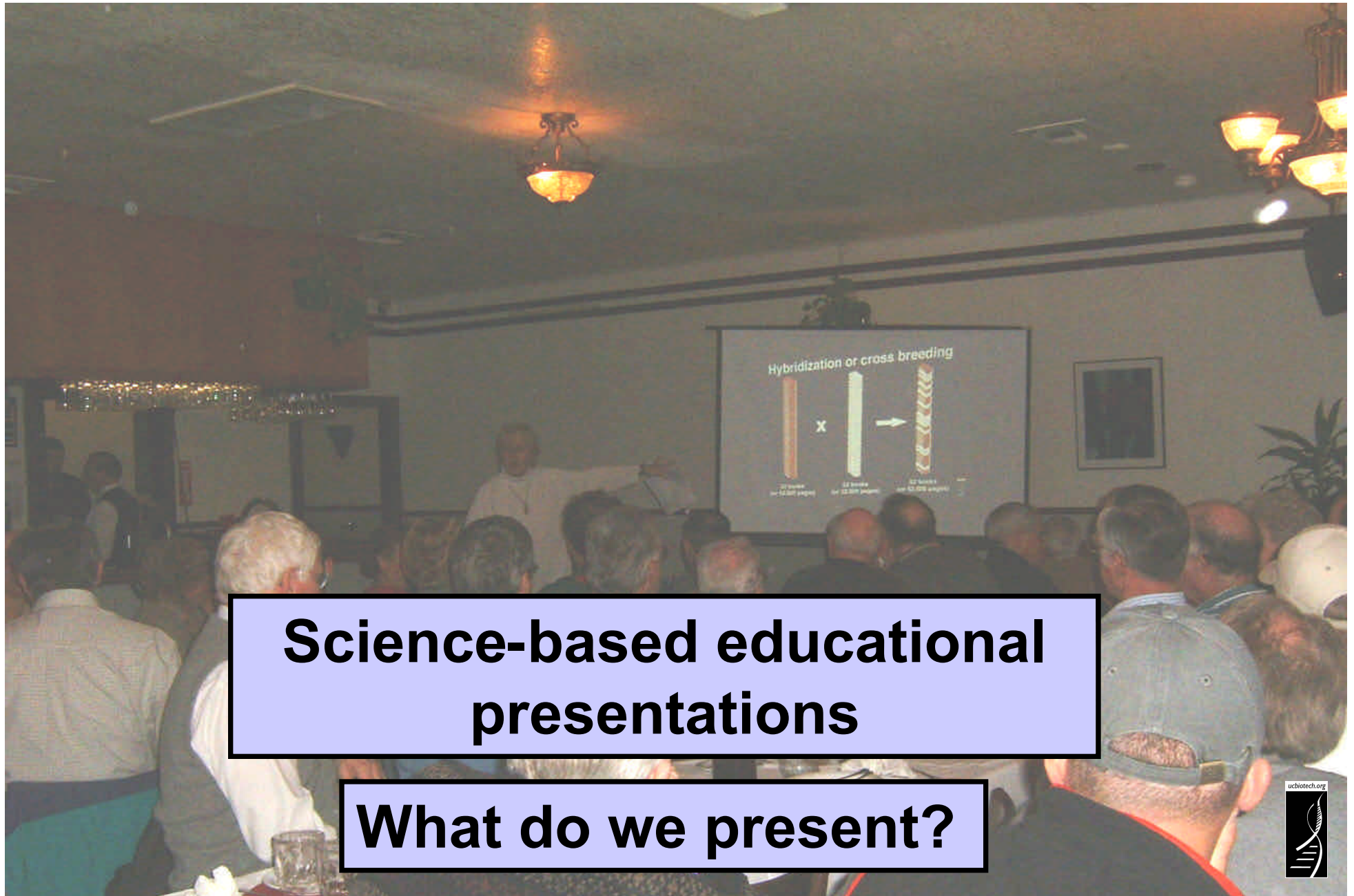
Informational pieces for newspapers...

with this... four-part series... "Grapes are grapes, or are they?" compared by Peggy G. Lemaux, UC Cooperative Extension, Berkeley. University of California, Berkeley. Any wine connoisseur knows you can't use Muscat grapes to make cabernet sauvignon wine. In fact, hundreds of different varieties of grapes are used for making wine. That uniqueness is due in part to the genetic information in grape, which determines its color, aroma, and wine characters. That information is arranged in recipes, or genes, made of chemical units. If alphabetic letters were used to represent each unit, 52 books of recipes, each with 1,000 pages, are needed to hold all information for a particular variety. A new grape variety, bred by cutting and crossing many grape varieties to add to the diversity of the grape, which produces wine, is being developed.

tions performed in a laboratory. Many food animal species have been genetically engineered (e.g. cows, sheep, chickens, pigs, fish), but currently none are available on the market. The Food and Drug Administration is responsible for regulating and ensuring the safety of GE food animals for the consumer. To date one company, Aqua Bounty, has requested approval to market a growth-enhanced GE salmon that is capable of growing four to six times faster (but not bigger) than standard salmon grown under the same conditions.

any genetic material from other species. Again, I doubt this is what supporters have in mind. Another crucial question that must be answered is how the measure will be enforced. Supporters say Measure H will not cost taxpayers anything, and will not increase government intrusion on farms and land. The county Agriculture Commissioner says he will not snoop in people's backyards. But if the Commissioner receives a complaint that "Farmer Smith is growing GMOs," how will he investigate the allegation without snooping in Farmer Smith's backyard? The Commissioner cannot detect GMOs by simple visual inspection. Instead, he will have to take a sample for laboratory testing. This will also occur in county inspections of plants and seeds coming into the county. Who pays for this expensive and time-consuming testing? This question, at least, is easy to answer. Taxpayers. If the test comes back positive, what if Farmer Smith denies any GMOs? Taxpayers will pay for the testing. Taxpayers will pay for the testing. Taxpayers will pay for the testing.





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