

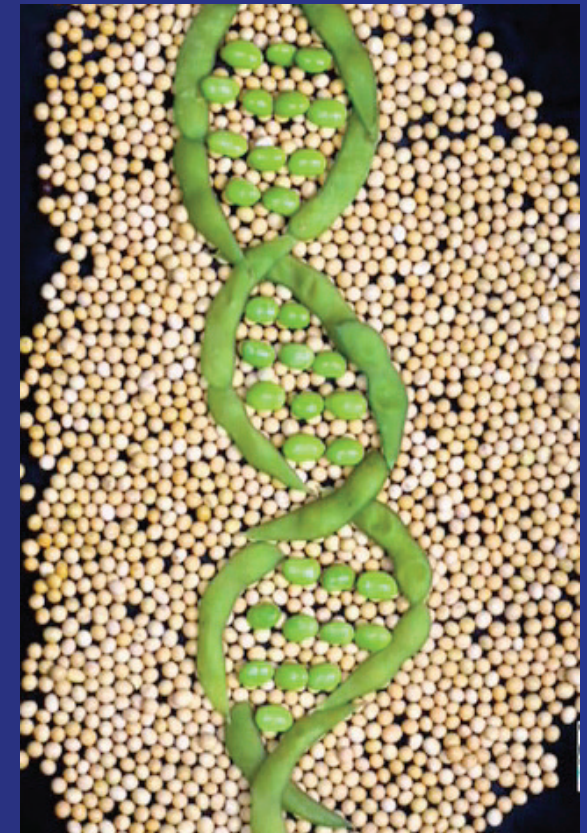


# “Food and Feed Safety of Genetically Modified Organisms (GMOs): The Hype and the Facts”

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<http://animalscience.ucdavis.edu/animalbiotech>

FEWER MOLES

MORE MOLES



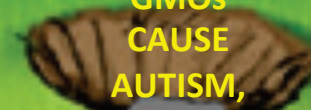
SCIENTISTS  
ARE BAD;  
ACTIVISTS  
ARE GOOD



EATING  
MEAT  
CAUSES  
GLOBAL  
WARMING



GMOs  
CAUSE  
AUTISM,  
CANCER etc.



PINK  
SLIME



ANTIBIOTIC  
USE IN  
ANIMAL AG



FARMERS  
MISTREAT  
ANIMALS



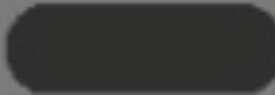
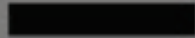
CONVENTIONAL  
AGRICULTURE  
DESTROYS THE  
ENVIRONMENT



LABEL  
GMOs  
OMG



ORGANIC  
IS BEST





# Dorothy, we are not in Kansas anymore



- Special interest groups have become disciplined, strategic and have little interest in scientific accuracy
- Need to communicate in language the public can relate to (and understand!)
- Social media has changed everything – need to respond in real time



# I do not like the term genetically modified or GMO – because it is ambiguous as to what “modified” means



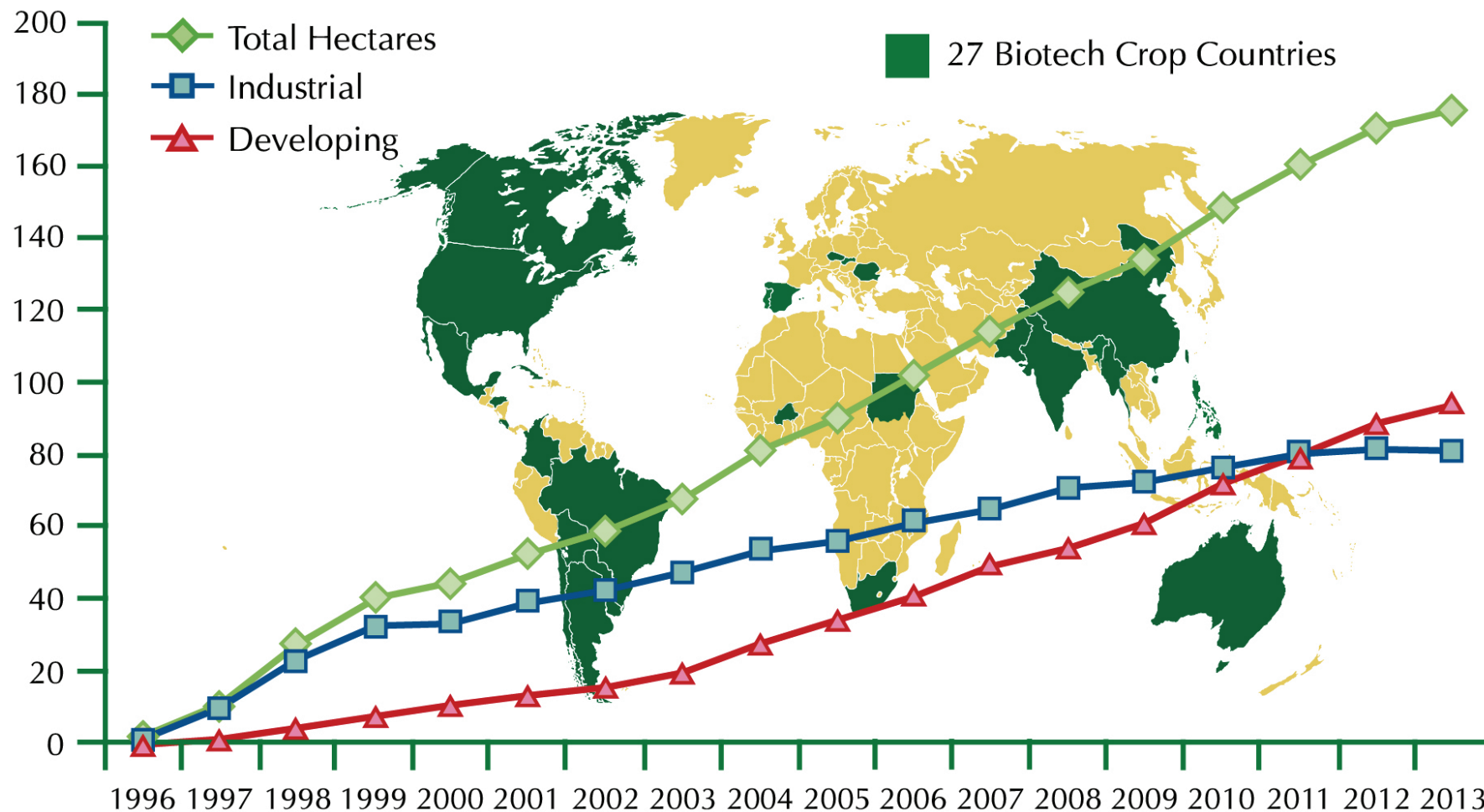


# I prefer the term genetic engineering (GE) as it means something specific



- The USDA's current definition of genetic engineering is “manipulation of an organism’s genes by introducing, eliminating or rearranging specific genes using the methods of modern molecular biology, particularly those techniques referred to as recombinant DNA (rDNA) techniques.”
- Also known as genetically modified, GM, GMO, transgenic, bioengineered, biotech, made with modern biotechnology, Frankenfood

# Global Area of Genetically Engineered (GE) crops in 2013



*A record 18 million farmers, in 27 countries, planted 175.2 million hectares (433 million acres) in 2013, a sustained increase of 3% or 5 million hectares (12 million acres) over 2012.*

**Source: Clive James, 2013 ISAAA Brief 46-2013**



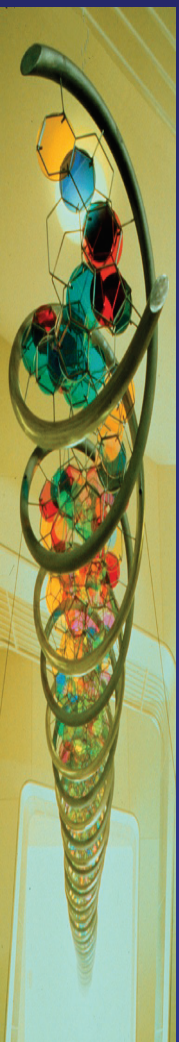
# Top Ten Myths about GE food

1. There is scientific uncertainty/lack of consensus about safety of GE





# Summary statements of leading science organizations regarding safety of genetic engineering



- “No effects on human health have been shown as a result of the consumption of such foods by the general population in the countries where they have been approved.”(World Health Organization)
- “No adverse health effects attributed to genetic engineering have been documented in the human population.” (National Academy of Sciences)
- “The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe.” (American Association for the Advancement of Science)
- “There is no scientific justification for special labeling of bioengineered foods. Bioengineered foods have been consumed for close to 20 years, and during that time, no overt consequences on human health have been reported and/or substantiated in the peer-reviewed literature.” (American Medical Association)
- “No scientific evidence associating GMOs with higher risks for the environment or for food and feed safety than conventional plants and organisms.” (European Commission)





# Professional Scientific and/or Medical bodies with an opinion on safety of GE

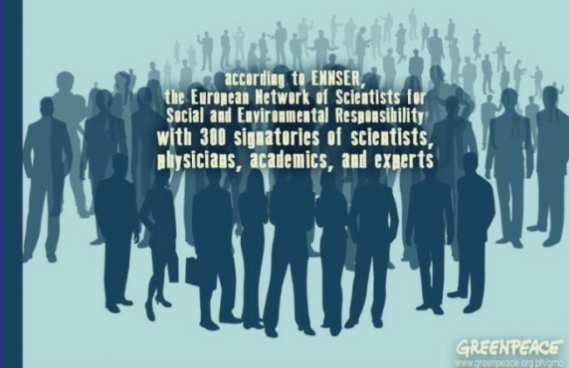
## Generally Positive

- ✓ The U.S. National Research Council (NRC)
- ✓ U.S. National Academy of Sciences (NAS)
- ✓ The American Medical Association, (AMA)
- ✓ U.S. Department of Agriculture (USDA)
- ✓ U.S. Environmental Protection Agency (EPA)
- ✓ U.S. Food and Drug Administration (FDA)
- ✓ European Food Safety authority (EFSA)
- ✓ American Society for Plant Biology (ASPB)
- ✓ Federation of Animal Science Societies (FASS)
- ✓ World Health Organization (WHO)
- ✓ Food and Agriculture Organization (FAO)
- ✓ Royal Society (London)
- ✓ Brazil National Academy of Science,
- ✓ Chinese National Academy of Science
- ✓ Indian National Academy of Science
- ✓ Mexican Academy of Science
- ✓ Third World Academy of Sciences

## Generally Negative

- ✓ The American Academy of Environmental Medicine (AAEM)\*
- ✓ The European Network of Scientists for Social and Environmental Responsibility

**THERE IS NO CONSENSUS ON  
GENETICALLY MODIFIED FOOD  
AND ENVIRONMENTAL SAFETY**



*\*Not recognized by the American  
Board of Medical Specialties*



# Top Ten Myths about GE food

1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been insufficient safety studies on GE crops





# This paper summarizes 1783 scientific papers on GE crop safety published between 2002 and 2012

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in Biotechnology**

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healthcare

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REVIEW ARTICLE

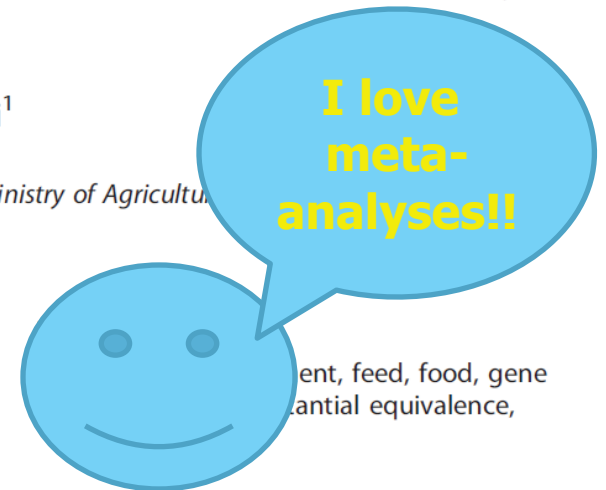
## An overview of the last 10 years of genetically engineered crop safety research

Alessandro Nicolìa<sup>1\*</sup>, Alberto Manzo<sup>2</sup>, Fabio Veronesi<sup>1</sup>, and Daniele Rosellini<sup>1</sup>

<sup>1</sup>Department of Applied Biology, Faculty of Agriculture, University of Perugia, Perugia, Italy and <sup>2</sup>Ministry of Agriculture, Food and Forestry Policy (MiPAAF), Rome, Italy

### Abstract

The technology to produce genetically engineered (GE) plants is celebrating its 30th anniversary and one of the major achievements has been the development of GE crops. The safety of GE crops is crucial for their adoption and has been the object of intense research work often ignored in the public debate. We have reviewed the scientific literature on GE crop safety during the last 10 years, built a classified and manageable list of scientific papers, and analyzed the distribution and composition of the published literature. We selected original research papers, reviews, relevant opinions and reports addressing all the major issues that emerged in the debate on GE crops, trying to catch the scientific consensus that has matured since GE plants became widely cultivated worldwide. The scientific research conducted so far has not detected any significant hazards directly connected with the use of GE crops; however, the debate is still intense. An improvement in the efficacy of scientific communication could have a significant impact on the future of agricultural GE. Our collection of scientific records is available to researchers, communicators and teachers at all levels to help create an informed, balanced public perception on the important issue of GE use in agriculture.



### History

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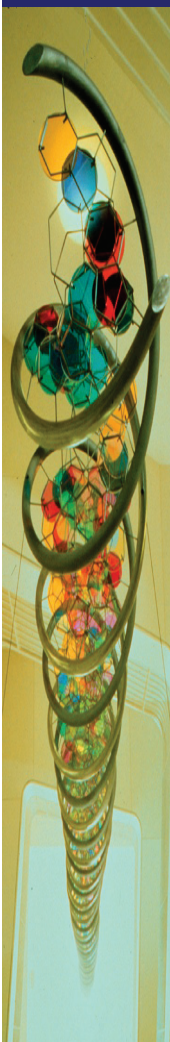
Revised 24 June 2013

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Published online 13 September 2013

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Toxicology 11/12/14





# Top Ten Myths about GE food



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been insufficient safety studies on GE crops
3. There have been no long term studies on the effects of GE crops



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# Food and Chemical Toxicology

journal homepage: [www.elsevier.com/locate/foodchemtox](http://www.elsevier.com/locate/foodchemtox)



## Review

### Assessment of the health impact of GM plant diets in long-term and multigenerational animal feeding trials: A literature review

Chelsea Snell<sup>a</sup>, Aude Bernheim<sup>b</sup>, Jean-Baptiste Bergé<sup>c</sup>, Marcel Kuntz<sup>d</sup>, Gérard Pascal<sup>e</sup>, Alain Paris<sup>f</sup>, Agnès E. Ricroh<sup>b,\*</sup>

<sup>a</sup> University of Nottingham, School of Biosciences, Sutton Bonington Campus, Loughborough, Leicestershire LE12 5RD, United Kingdom

<sup>b</sup> AgroParisTech, 16, rue Claude Bernard, 75231, Paris, Cedex 05, France

<sup>c</sup> Anthala, 239, chemin de Saint Claude, 06600 Antibes, France

<sup>d</sup> Laboratoire Physiologie Cellulaire Végétale, CNRS – Université Joseph Fourier – INRA, Institut de Recherches en Technologies et Sciences pour le Vivant, 38054 Grenoble, Cedex 9, France

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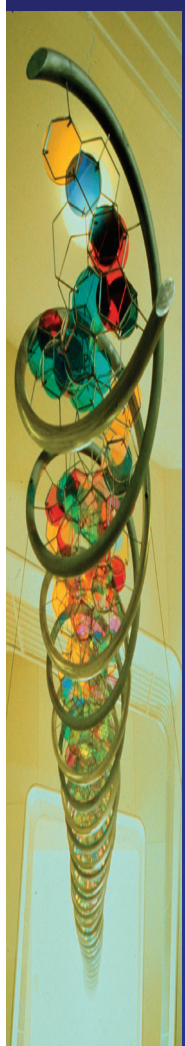
Multigenerational studies

Systematic review

## ABSTRACT

The aim of this systematic review was to collect data concerning the effects of diets containing GM maize, potato, soybean, rice, or triticale on animal health. We examined 12 long-term studies (of more than 90 days, up to 2 years in duration) and 12 multigenerational studies (from 2 to 5 generations). We referenced the 90-day studies on GM feed for which long-term or multigenerational study data were available. Many parameters have been examined using biochemical analyses, histological examination of specific organs, hematology and the detection of transgenic DNA. The statistical findings and methods have been considered from each study. Results from all the 24 studies do not suggest any health hazards and, in general, there were no statistically significant differences within parameters observed. However, some small differences were observed, though these fell within the normal variation range of the considered parameter and thus had no biological or toxicological significance. If required, a 90-day feeding study performed in rodents, according to the OECD Test Guideline, is generally considered sufficient in order to evaluate the health effects of GM feed. The studies reviewed present evidence to show that GM plants are nutritionally equivalent to their non-GM counterparts and can be safely used in food and feed.

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# Meta-analysis of long-term and multigenerational animal feeding trials

- Published long-term feeding studies using a GE-based diet ranged from 110-728 days
- All done by independent researchers – not industry
- The longest multigenerational study involved 10 generations.

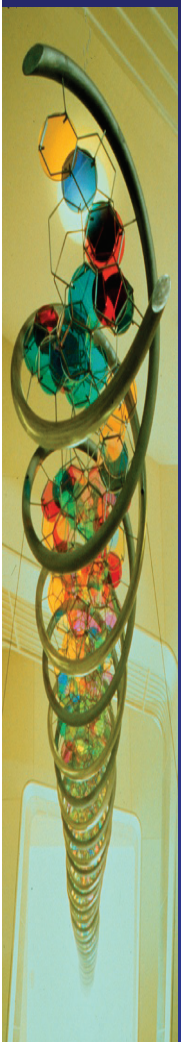
*“The studies reviewed present evidence to show that GM plants are nutritionally equivalent to their non-GM counterparts and can be safely used in food and feed.”*



Snell C, Bernheim A, Berge JB, Kuntz M, Pascal G, Paris A, Ricroch AE. 2012. **Assessment of the health impact of GM plant diets in long-term and multigenerational animal feeding trials: a literature review.** *Food Chem Toxicol* **50**:1134–1148.



# Top Ten Myths about GE food

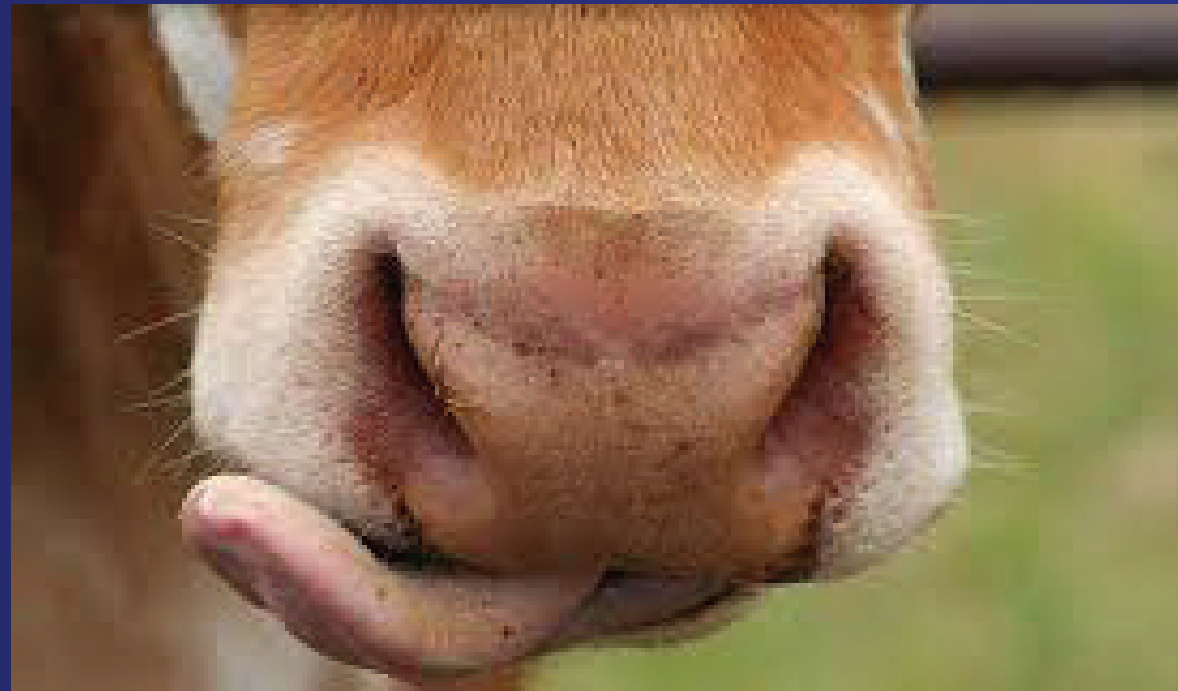


1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been insufficient safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, rats with tumors, early mortality)



# Global livestock populations have been eating predominately GE feed for well over a decade

70-90% of harvested GE biomass is fed to food producing animals

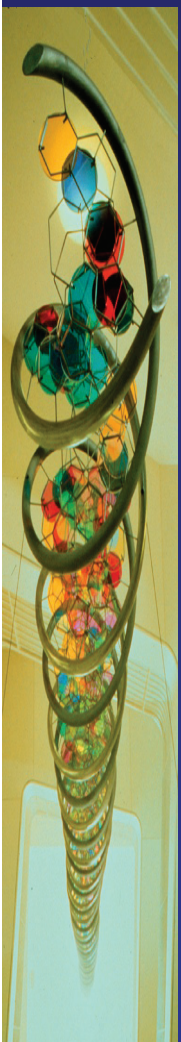


Flachowsky G, Schafft H, Meyer U: 2012 **Animal feeding studies for nutritional and safety assessments of feeds from genetically modified plants: a review.** (*Journal of Consumer Protection and Food Safety*) :179–194.





# Global livestock populations have been eating predominately GE feed for well over a decade



Industry	Number of organic farms in U.S. <sup>a</sup>	Number of animals on organic farms. <sup>a</sup>	Total number of livestock animals in U.S. <sup>b</sup>	Organic livestock numbers as % of U.S. Total <sup>c</sup>
Broiler	153	28,644,354	<b>8,607,600,000</b>	0.33%
Layers	413	6,663,278	<b>338,428,000</b>	1.97%
Turkeys	70	504,315	<b>248,500,000</b>	0.20%
Beef cows	488	106,181	<b>30,850,000</b>	0.34%
Dairy cows	1,848	254,711	<b>9,150,000</b>	2.78%
Hogs	97	12,373	<b>110,860,000</b>	0.01%

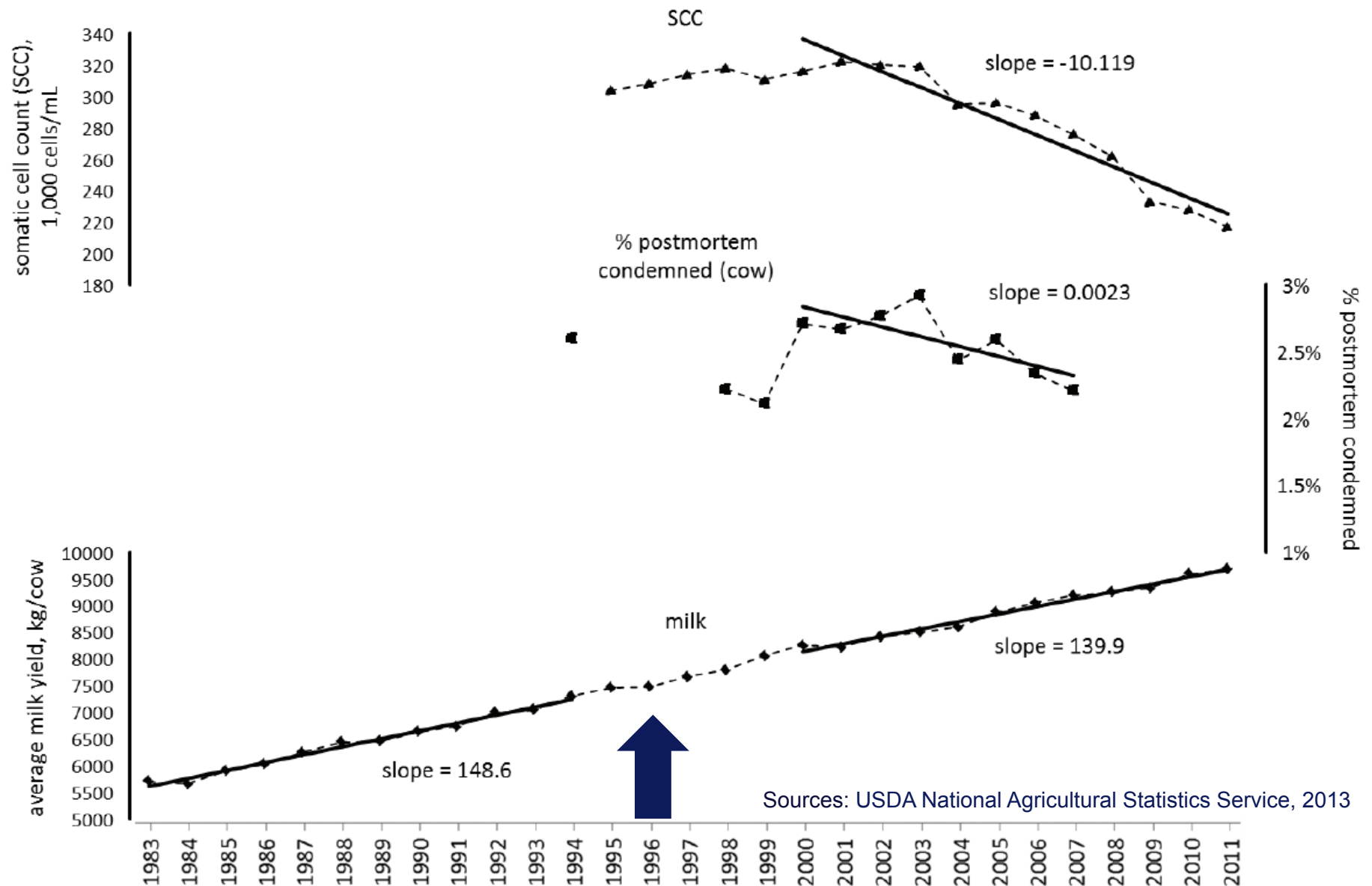
<sup>a</sup> USDA National Agricultural Statistics Service, 2012.

<sup>b</sup> USDA Economics Statistics and Market Information System, 2013

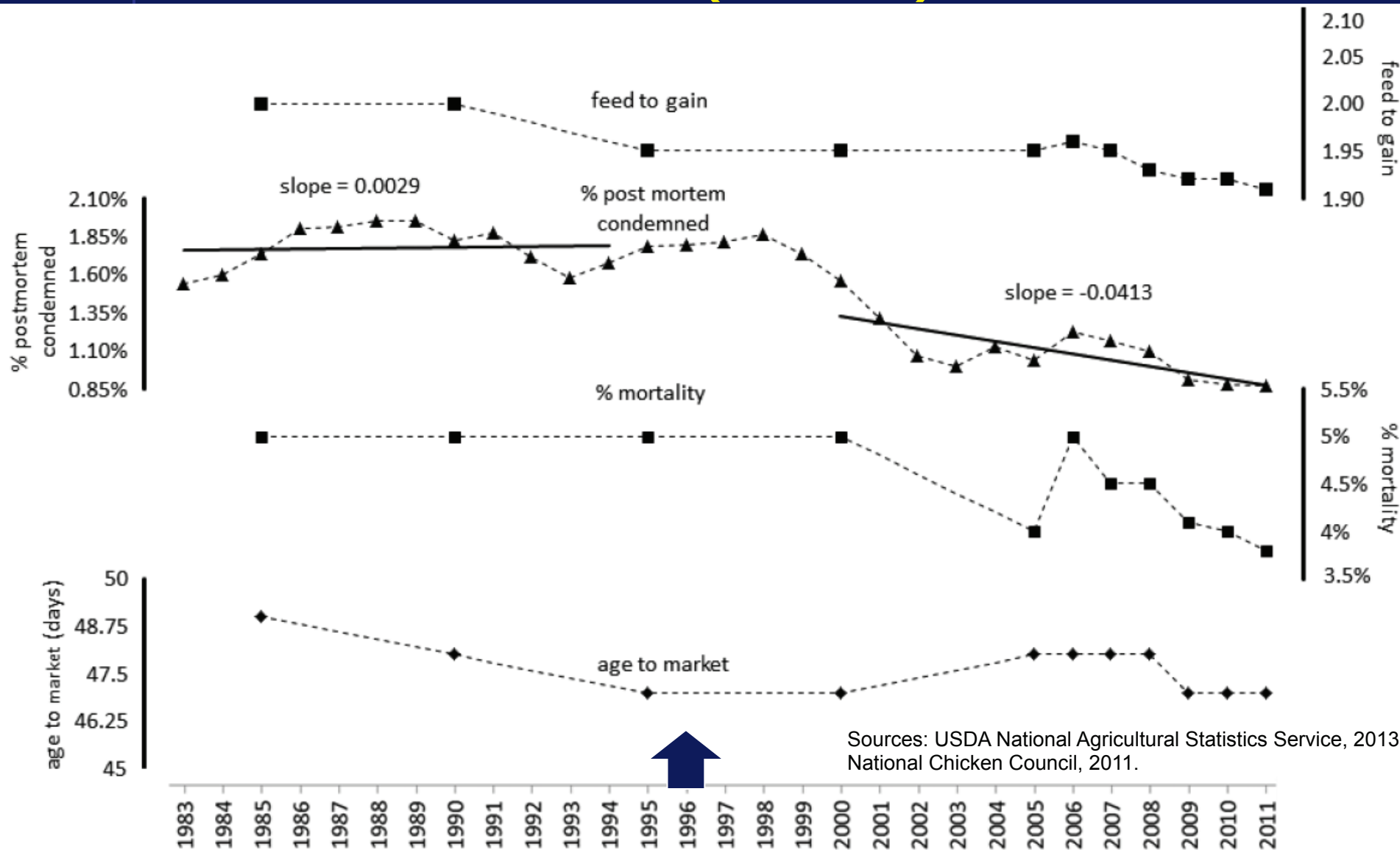
<sup>c</sup>

[http://www.ers.usda.gov/datafiles/Organic\\_Production/National\\_Tables\\_/CertifiedandtotalUSacreageselectedcropslivestock.xls](http://www.ers.usda.gov/datafiles/Organic_Production/National_Tables_/CertifiedandtotalUSacreageselectedcropslivestock.xls)

# Milk production, percent postmortem condemned, and somatic cell counts for the United States before and after the introduction of genetically engineered crops in 1996.



# US broiler statistics prior to and subsequent to the introduction of GE crops in 1996. Slope differs between time periods 1983-1994 and 2000-2011 (\*P < 0.05)

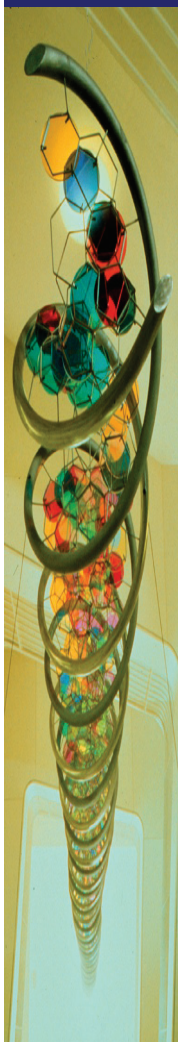




# Top Ten Myths about GE food



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been insufficient safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. **Meat, milk and eggs from animals that have eaten GE crops is unsafe/different/dangerous and needs to be labeled**



**CHOBANI**  
GREEK YOGURT

**Chobani uses milk from cows fed GMOs.  
How "natural" is THAT?**



**Monsanto Latte?**

**Tell Starbucks to serve  
only organic, non-GMO milk.**

**GMOINSIDE**  
Coalition Powered by Green America



**I WANT  
#OrganicMilkNext!**

**"GMO Feed... fed to all factory  
farmed animals. What they  
eat - we eat. Let's start at the  
beginning and do this right.  
Don't buy it if it ate GMOs."**

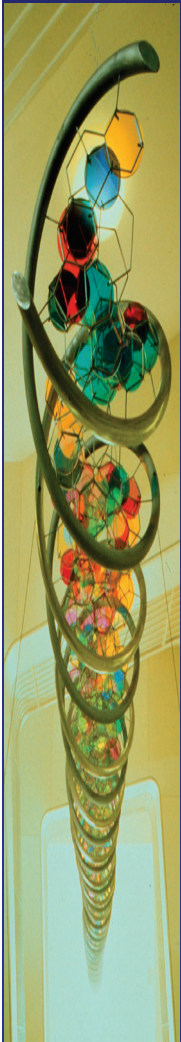
—ELLIE KIRCHNER, GMO INSIDER



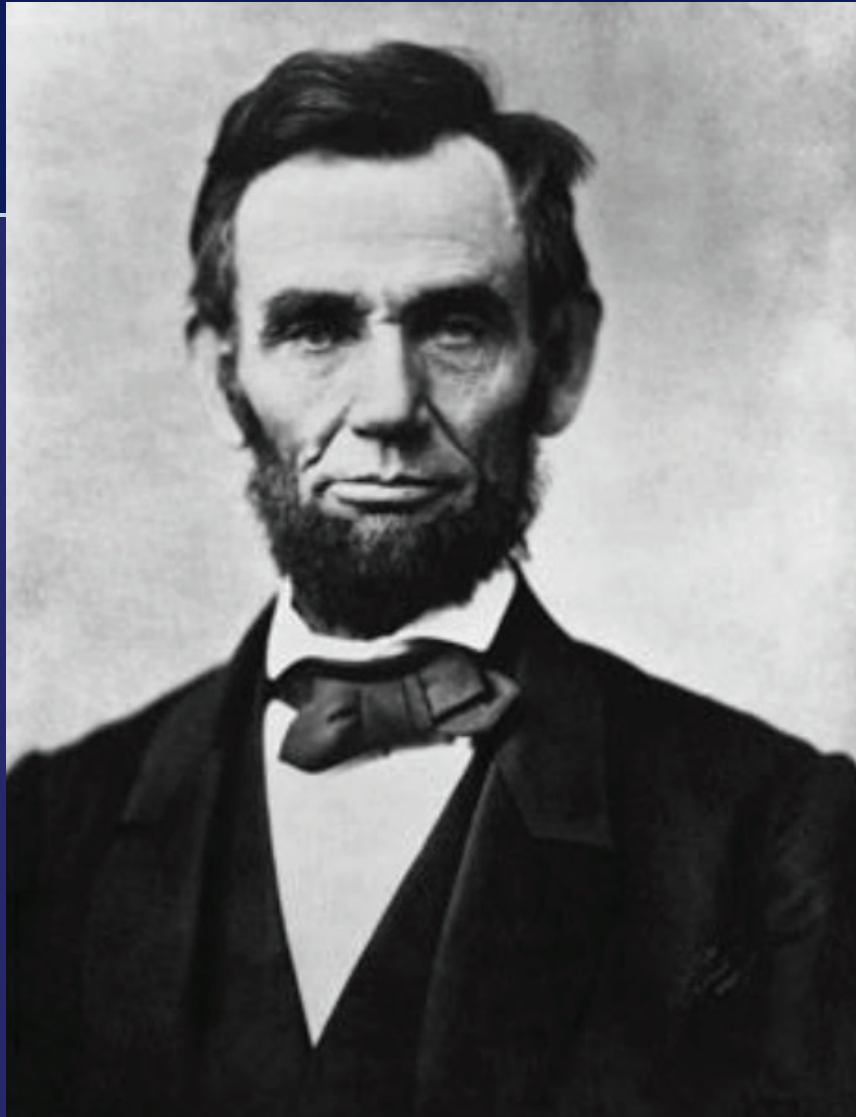
**Are You a GMO Latte  
Drinking Lab Rat?**

Tell Starbucks to serve only organic milk.





# Scientists better get to know Memes!



“Don’t believe everything you read on the Internet just because there’s a picture with a quote next to it.”

—Abraham Lincoln

<http://weknowmemes.com/2012/07/dont-believe-everything-you-read-on-the-internet>



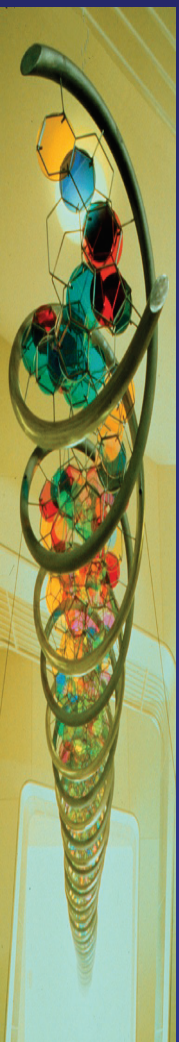
# Americans have so many causes to choose from!

*Economic Inequality*  
*Equal Rights*  
*Health Care*  
*Climate Change*  
*Malnutrition and Hunger*  
*Water*  
*Poverty/Unemployment*  
*Education*  
*College Loan Debt*  
*Energy*  
*Corporate Tax Evasion*  
*Immigration Reform*  
*Campaign Reform*

## And you choose Starbucks milk?



# Does eating GE feed affect the products derived from livestock (i.e. milk, meat, eggs)?



- Because DNA and protein are normal components of the diet that are digested, there are no detectable or reliably quantifiable traces of GE components in milk, meat and eggs following consumption of GE feed
- It is not possible to distinguish any differences in the nutritional profile of animal products following consumption of GE feed
- It is not possible to test for GE feed consumption based on composition of milk, meat, eggs (i.e. indistinguishable)
- Labeling of such animal products is not currently mandatory in Europe or anywhere else in the world except Brazil and not being enforced there





# Top Ten Myths about GE food



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been insufficient safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. Meat, milk and eggs from animals that have eaten GE crops is unsafe/different
6. The producers of GE crops aren't required to do any testing

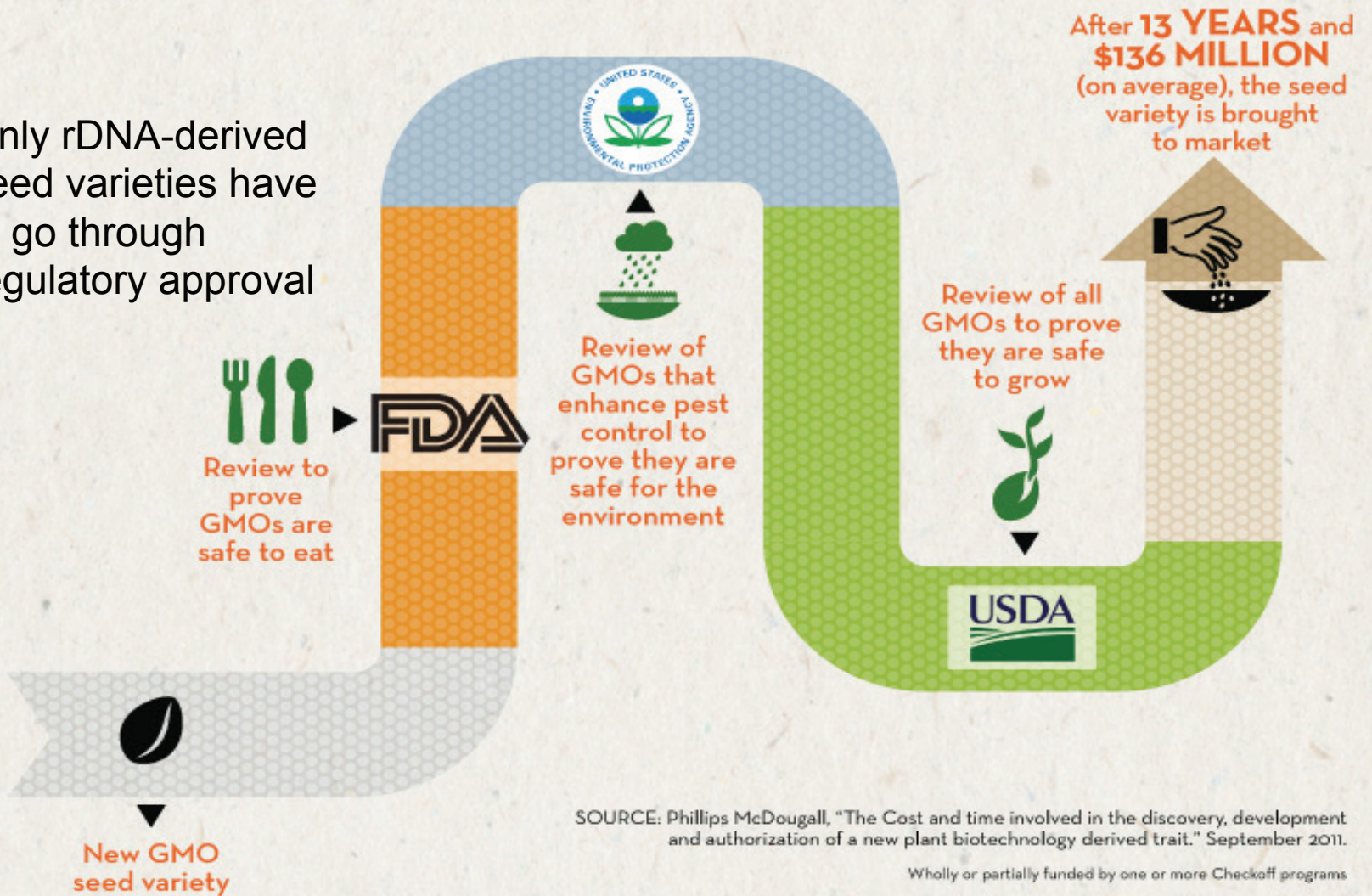


# HOW A GM SEED GETS TO MARKET

No other type of new seed that comes to market from other breeding methods goes through regulatory approval, including the thousands of conventional and organic seeds developed from mutagenesis\*. Only GMOs are required to be reviewed. Even before the new seed goes through the review process, years of testing and research take place.

\*Deliberately engineered DNA mutations

Only rDNA-derived seed varieties have to go through regulatory approval

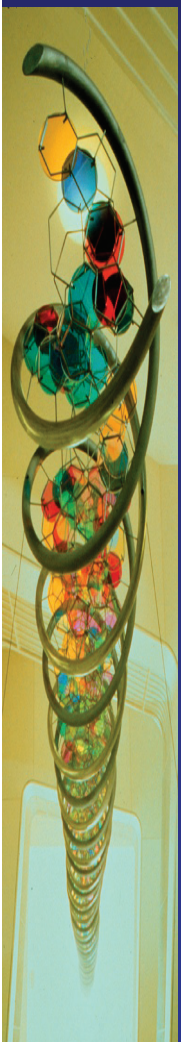


SOURCE: Phillips McDougall, "The Cost and time involved in the discovery, development and authorization of a new plant biotechnology derived trait." September 2011.

Wholly or partially funded by one or more Checkoff programs



# All GE crops commercialized to date have been evaluated by the FDA



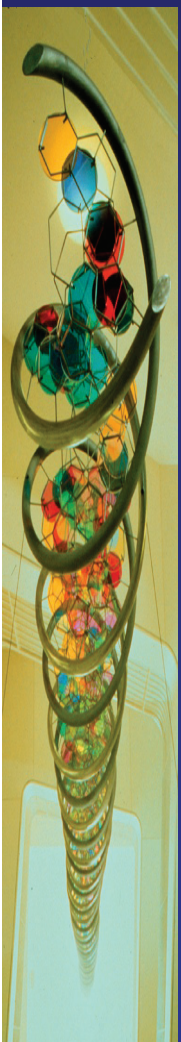
- During the past 20 years, the FDA has found that **all 148 transgenic gene/crop combinations** evaluated by the agency (including all biotech crops commercialized to date, despite the fact that this premarket safety review is technically voluntary) are equivalent to their conventional counterparts.
- **Japanese regulators independently reached the same conclusions for 189 submissions they reviewed.**
- These submissions spanned GE corn, soybean, cotton, canola, wheat, potato, alfalfa, rice, papaya, tomato, cabbage, pepper, raspberry, and mushroom, and they included traits of herbicide, drought and cold tolerance, insect and virus resistance, nutrient enhancement, and expression of protease inhibitors



Herman, R. A. and W. D. Price. 2013. Unintended compositional changes in genetically modified (GM) crops: 20 years of research. *J Agr Food Chem*, 61 (48), pp 11695–11701



# Top Ten Myths about GE food



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2. There have been no independent safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. Meat, milk and eggs from animals that have eaten GE crops is unsafe/different
6. The producers of GE crops aren't required to do any testing
7. **Mandatory GE labeling will have no impact the price of food**



# CAST<sup>®</sup> Issue Paper

Number 54  
April 2014

## The Potential Impacts of Mandatory Labeling for Genetically Engineered Food in the United States



**CAST ISSUE PAPER 54, APRIL 2014**

Available for free download at  
Council for Agricultural Science and Technology (CAST)  
<http://www.cast-science.org>

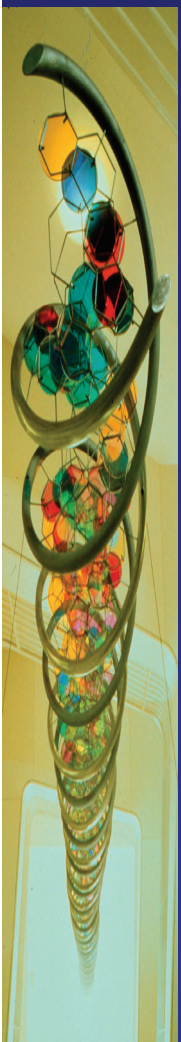


# The actual cost of GE labeling will depend on how manufacturers, grocers, consumers and activists respond to the mandatory labeling.

A recent study out of Cornell found the average cost to a family of four for mandatory labeling would be around **\$500/year**  
<http://dyson.cornell.edu/people/profiles/docs/LabelingNY.pdf>

The actual cost is impossible to know *a priori* and so any estimate is really an educated guesstimate – for sure it will not be zero.

It would be exceedingly complex to track all of the products on the grocery shelf that might contain GE ingredients e.g. > 95% of US sugar beets are GE – but can't test sugar as rDNA or the recombinant protein are not present in the sugar i.e. it is literally indistinguishable from non-GE sugar - so no way to verify whether it came from non-GE cane sugar or sugar beet – so complying with labeling law would require supply chain segregation and tacking – and that is expensive.





# Some of the proposed labeling legislation is unworkable e.g. RO

Requires that at the first stage of the placing on the market of a product consisting of or containing GMOs, including bulk quantities, operators shall ensure that the following information is transmitted in writing to the operator receiving the product:

- (i) That it contains or consists of GMOs
- (ii) An identification of the GMOs within the product.
- (iii) In the case of products consisting of or containing mixtures of GMOs to be used only and directly as food or feed for for processing, the information referred to in subsection (ii) may be replaced by a declaration of use by the operator, accompanied by a list of the unique identifiers\* for all those GMOs that have been used to constitute the mixture.

\* "Unique identifier" means a simple numeric or alphanumeric code which serves to identify a GMO **on the basis of the authorized transformation event** from which it was developed and providing the means to retrieve specific information pertinent to that GMO

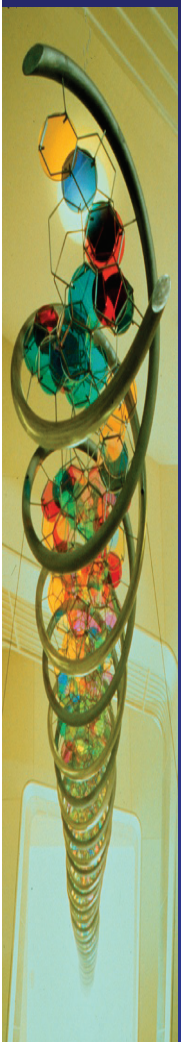
**US has a total of 171 GE approved events in 19 plant species!**

<http://www.isaaa.org/gmaprovaldatabase/approvedeventsin/default.asp?CountryID=US&Country=United States of America>

**GMO LABELING:**

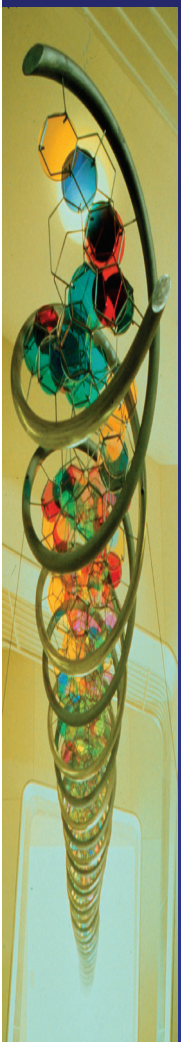


**THE CROP BREEDING METHOD ISN'T LABELED ON MY PROCESSED FOOD**





# Top Ten Myths about GE food



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3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. Meat, milk and eggs from animals that have eaten GE crops is unsafe/different
6. The producers of GE crops aren't required to do any testing
7. Mandatory GE labeling will have no impact the price of food
8. **GE crops have not benefitted farmers or the environment and have resulted in a huge increase in the use of pesticides**





# In the US there have been substantial benefits from GE crops

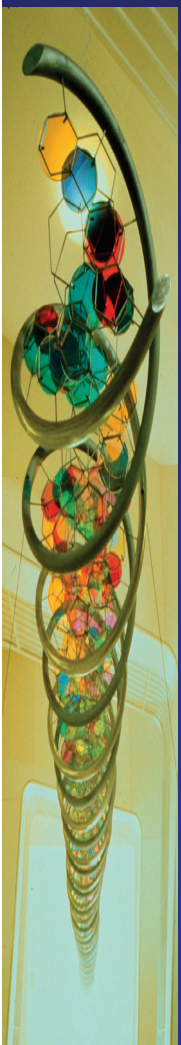
Since GE seeds were introduced in the mid-1990s, farmers have opted for these products. A report from the National Research Council of the **U.S. National Academy of Sciences**, "The Impact of Genetically Engineered Crops on Farm Sustainability in the United States," offers an insight as to why. The report concludes that U.S. farmers growing biotech crops "***..are realizing substantial economic and environmental benefits — such as lower production costs, fewer pest problems, reduced use of pesticides, and better yields — compared with conventional crops.***"

National Research Council. Impact of Genetically Engineered Crops on Farm Sustainability in the United States . Washington, DC: The National Academies Press, 2010. See also

Fernandez-Cornejo, Jorge, Seth Wechsler, Mike Livingston, and Lorraine Mitchell. *Genetically Engineered Crops in the United States*, ERR-162 U.S. Department of Agriculture, Economic Research Service, February 2014.



# Global impact of GE crops



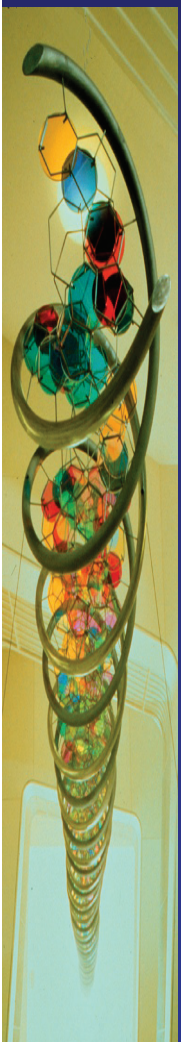
- "From 1996 to 2012, GE crops contributed to food security, sustainability and the environment/climate change by: *increasing crop production valued at US\$116.9 billion; providing a better environment by saving 497 million kg active ingredient of pesticides; in 2012 alone reducing CO<sub>2</sub> emissions by 26.7 billion kg, equivalent to taking 11.8 million cars off the road for one year; conserving biodiversity by saving 123 million hectares of land from 1996-2012; and helped alleviate poverty for >16.5 million small farmers and their families totaling >65 million people, who are some of the poorest people in the world.*"
- **Biotech crops are not a panacea and adherence to sustainable farming practices such as rotations and resistance management (IPM), are a must for GE crops as they are for conventional crops.**

International Service for the Acquisition of Agri-Biotech Applications [www.isaaa.org/](http://www.isaaa.org/);

Carpenter J.E. (2013). "The socio-economic impacts of currently commercialised genetically engineered crops,"



# Top Ten Myths about GE food



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been insufficient safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. Meat, milk and eggs from animals that have eaten GE crops is unsafe/different
6. The producers of GE crops aren't required to do any testing
7. Mandatory GE labeling will have no impact the price of food
8. GE crops have not benefitted farmers or the environment and have resulted in a huge increase in the use of pesticides
9. **Crop yields are actually down due to the use of GMO seeds**



# Globally there are substantial benefits from first generation (input trait) GE crops

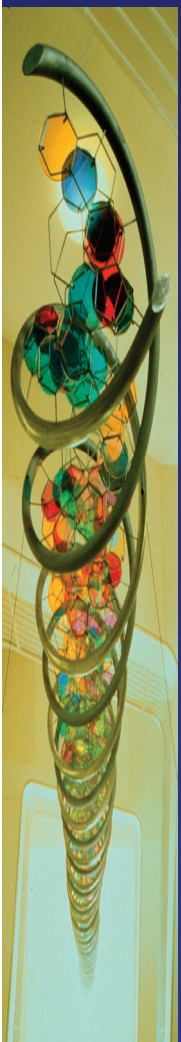
“On average, GE technology adoption has reduced chemical pesticide use by 37%, increased crop yields by 22%, and increased farmer profits by 68%. Yield gains and pesticide reductions are larger for insect-resistant crops than for herbicide-tolerant crops. Yield and profit gains are higher in developing countries than in developed countries.”



Klümper W, Qaim M (2014) A Meta-Analysis of the Impacts of Genetically Modified Crops. PLoS ONE 9(11): e111629.



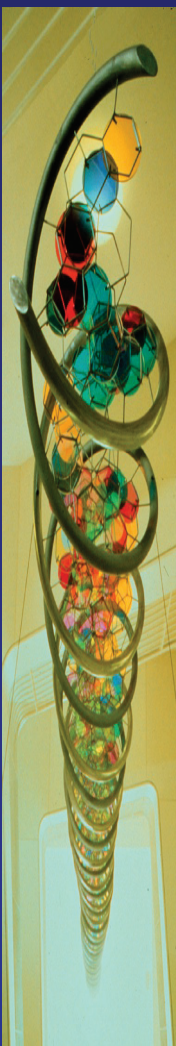
# Top Ten Myths about GE food



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9. Crop yields are actually down due to the use of GMO seeds
10. They are not going to be part of the solution to food insecurity; and anyway there is plenty of food to feed everyone – it is a distribution problem or worse – there are too many people anyway



# It is an interesting social phenomenon that this never makes the front page



*“In human terms, the millions and millions of lives lost in preventable deaths is the biggest story of any year.*”

**STARVATION IS THE REAL RISK:** About 21,000 people die every day of hunger or hunger-related causes, according to the United Nations. That is one person every four seconds. Sadly, it is children who die most often. Risk = probability of occurrence x hazard = 21,000 deaths/day

<http://www.smh.com.au/news/world/why-you-will-never-see-a-front-page-likethis/2005/06/30/1119724757442.html>

## The Sydney Morning Herald

EXTENT OF CRISIS REVEALED

# 20,000 die each day

Matt Wade

Extreme poverty claimed more than 20,000 lives yesterday with infectious and diarrhoea, accounting for a third of the victims. Another 20,000 people are expected to die from treatable illnesses today - and again tomorrow.

The three biggest killers - respiratory infections, diarrhoea and malnutrition - took nearly 14,000 lives, the majority of them children under the age of five.

More than 6,000 of the deaths yesterday were in just four African countries: Nigeria, the Democratic Republic of Congo, Ethiopia and Tanzania.

Priscy O'Connell, 33, an Australian aid worker in Ethiopia with Médecins Sans Frontières, said her biggest frustration was the lack of affordable medicines to treat illnesses such as malaria, HIV/AIDS and kala-azar - a parasitic disease that can be fatal if left untreated.

"Kala-azar and malaria are curable, HIV/AIDS is treatable, yet the majority of Ethiopians do not have access to basic health care or life-saving drugs as they die," she told the Herald.

About 250 million people - 13 times the population of Australia - have died from poverty-related causes since 1990. Leaders from the world's eight wealthiest countries - the G8 - will discuss increased aid spending at a meeting in Scotland next week.

The group is under pressure to provide more meaningful assistance, especially for Africa.

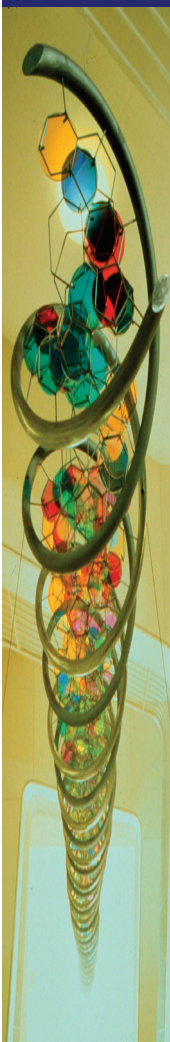
The catastrophe is expected to continue ...





# Partial list of publicly-funded applications

## Genetic engineering technology often gets identified with Monsanto/Big Ag policy. It is a tool – not a company, specific application or production system



- University of Hawaii/Cornell **Rainbow Papaya** – highly resistant to ringspot virus
- SUNY-ESF **American Chestnut tree** – resistant to blight (wheat gene)
- Texas A&M **Orange** - resistant to citrus greening (spinach gene)
- USDA-ARS Appalachian Fruit Research Station **Honeysweet Plum** - highly resistant to plum pox potyvirus (PPV)
- INRA's virus-resistant **Grape rootstock** – resistant to the grapevine fanleaf virus
- CSIRO's low G.I. **Wheat** - altering wheat carbohydrate content to reduce glycaemic response and improve metabolic health
- Rothamsted's aphid-repelling **Wheat** - produces high levels of aphid repelling odor
- Bangladeshi B.t. **Eggplant** - pest-resistant Bt brinjal (eggplant)
- **Biocassava** (Bill & Melinda Gates Foundation, the National Root Crop Research Institute of Nigeria and the Donald Danforth Plant Science Center) - cassava with increased nutrient (zinc, iron, protein, and vitamin A) levels, increased shelf life, reductions in toxic cyanogenic glycosides, and resistance to viral disease for Africa
- **Golden Rice** (USAID, the Syngenta Foundation, HarvestPlus, and the Bill & Melinda Gates Foundation) rice enriched with beta-carotene - the delayed application of Golden Rice in India alone has cost 1,424,000 life years since 2002



Orange Juice  
May Soon  
Contain  
Pig Genes



# GMOs

5 DANGERS + THE AUTISM/ALLERGY CONNECTION



# 400% increase

in allergies since GMOs were introduced.



Coalition Powered by Green America  
**GMOINSIDE!**

#SimilacNoGMO

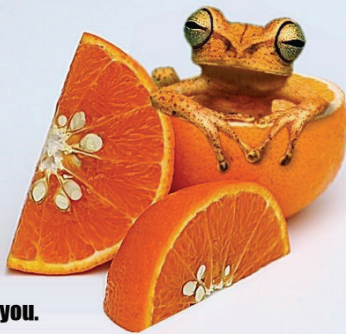


Will **Roundup** rob  
him of someday having  
babies of his own?

Gerber uses RoundUp Ready GMOs in its Good Starts for American babies. But a new study published in the journal *Free Radical Medicine & Biology* implicates Roundup in male infertility at concentration levels well within the EPA's "safe levels" for food.

**That's NOT a Good Start, Gerber!**

Genetically Modified  
**Oranges**  
gene spliced with  
**Frogs**



Coming soon to a grocery store near you.

One New Apple Product  
Your Family Doesn't Need.



Just say "know" to  
genetically engineered apples.

Pro-GMO organizations argue that in a world where food is scarce, they are helping to feed the hungry. Feeding people untested lab modified food (GMOs) is like one giant science experiment gone bad! You can feed rice mixed with a little rat poison to a starving African child each day and claim, "I am feeding this child!" The ability to stave off starvation does not counteract the poisonous side-effects!



United Nations Photo



homecuresthatwork.com

Toxicology 11/12/14

Animal Genomics and Biotechnology Education



Thank you, **GREENPEACE** for ripping up Golden Rice fields.



Now, I'll never have to see a single baby seal being clubbed.



# Kids Need Food Not Propaganda



## Greenpeace's Crime Against Humanity

### 8 Million Children Dead

**GOLDEN RICE NOW**

[AllowGoldenRiceNow.org](http://AllowGoldenRiceNow.org)

**GOLDEN RICE NOW**

**INDEPENDENT SCIENTISTS AGREE THAT GOLDEN RICE COULD HAVE SAVED MY VISION**



**THANKS FOR BLOCKING IT. ENJOY YOUR \$10 WHOLE FOODS ORGANIC PUMPKIN BISQUE.**





# The Science of Science Communication PNAS issue



*“Some of the most polarizing topics in American politics are scientific ones. Even the existence of phenomena, such as global climate change and evolution, that are widely accepted in the scientific community is questioned by significant proportions of the US public.”*

Scheufele DA. Science communication as political communication. *Proceedings of the National Academy of Sciences* 2014;111:13585-13592.

***“Today, scientists and doctors find themselves outnumbered and outgunned by vast armies of individuals who feel entitled to pass judgment on matters of evidence—an admirable aspiration—without troubling themselves to obtain a basic understanding of the issues.”***

— Ben Goldacre, *Bad Science: Quacks, Hacks, and Big Pharma Flacks*

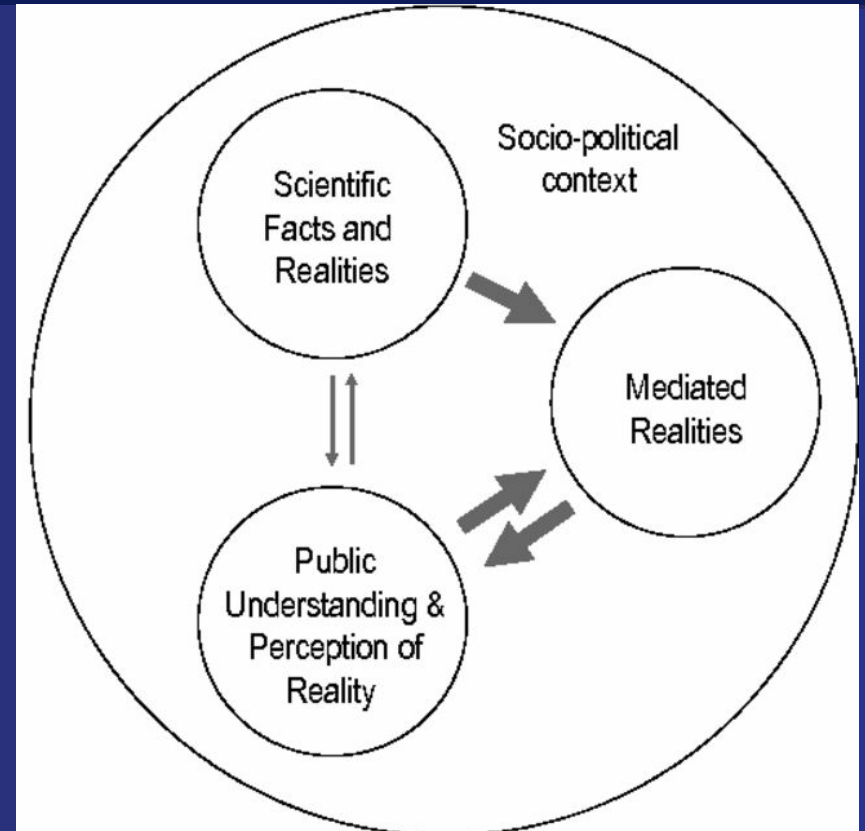


## Spiral-of-silence model (Elizabeth Noelle-Neumann, 1974)

Most people are to some degree fearful of isolating themselves in social settings and this “fear of isolation” makes them less likely to express unpopular opinions in public



*“The mechanisms outlined in “the spiral of silence” are also the basis of the communication strategies of many interest groups and nonprofits. Anti-GMO activists, for instance, often rely on activities with high public visibility, such as unregistered demonstrations that lead to arrests, to create media coverage. The hope is that the publicity that these activities create will lead to inflated public perceptions of how widespread the opposition is to a technology, such as GMOs, and potentially trigger spirals of silence in its wake.”*



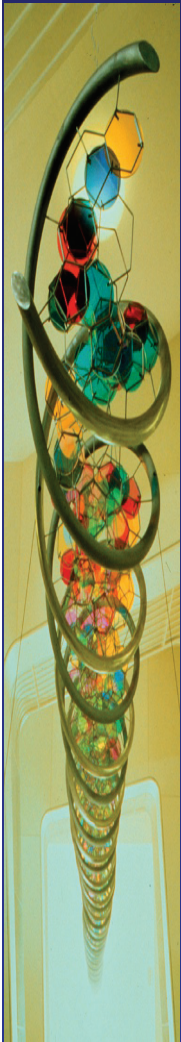
Scheufele DA. 2014. Science communication as political communication. PNAS. 111:13585-13592.



# The internet and social media have opened up dialogue – and have been used to counteract the spiral of silence .....

- *“Scientists and universities need to develop proactive communication strategies that accurately portray scientific consensus in public discourse. Such efforts will go a long way toward countering the development of spirals of silence based on misperceptions of public support or opposition.”*

Scheufele DA. 2014. Science communication as political communication. PNAS. 111:13585-13592.



Scientists now know that many dinosaurs actually had feathers, including the velociraptor. Many people find this hard to accept, resulting in Jurassic Park 4 being scientifically inaccurate to please its fans...

A little annoying but probably not a big deal








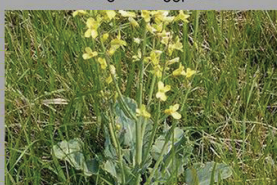
The scientific consensus on genetically modified foods is that they are as safe, if not safer, than other foods. Many people find this difficult to accept, resulting in the banning of GM food across Europe and the deaths of thousands of starving people in developing countries

Probably the biggest deal of this century.

**SCIENTIFIC CONSENSUS**  
Sometimes it really really #\$\$@%ing matters

[www.axismundionline.com](http://www.axismundionline.com)

have you ever wondered how food would be like if humans did not modify it throughout thousands of years?

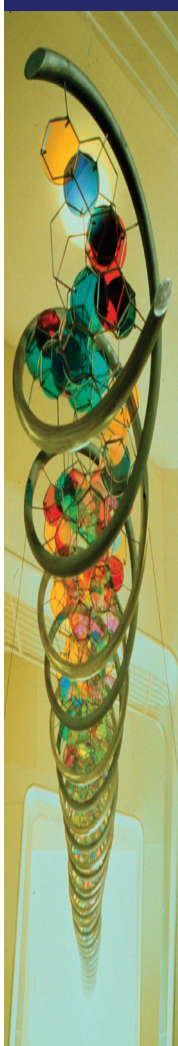
 watermelon	 corn
 banana	 aubergine / eggplant
 carrot	 cabbage, kale, broccoli, etc.



**The internet and social media have opened up dialogue – and have been used to counteract the spiral of silence .....and also reinforce it**



Control image downloaded from <http://www.ratfanclub.org/mamtumpics.html>  
Approx. 70% of female Sprague–Dawley rats get mammary tumors by 2 years of age



# Incidences of Selected Lesions in Control Female Harlan Sprague–Dawley Rats from Two-Year Studies Performed by the National Toxicology Program

AMY E. BRIX,<sup>1</sup> ABRAHAM NYSKA,<sup>2</sup> JOSEPH K. HASEMAN,<sup>3</sup> DONALD M. SELLS,<sup>4</sup> MICHEAL P. JOKINEN,<sup>5</sup> AND NIGEL J. WALKER<sup>6</sup>

<sup>1</sup>*Experimental Pathology Laboratories, Research Triangle Park, North Carolina 27709, USA*

<sup>2</sup>*Laboratory of Experimental Pathology, National Institute of Environmental Health Sciences (NIEHS), Research Triangle Park, North Carolina 27709, USA*

<sup>3</sup>*Biostatistics Branch, National Institute of Environmental Health Sciences (NIEHS), Research Triangle Park, North Carolina 27709, USA*

<sup>4</sup>*Battelle Columbus Laboratories, Columbus, Ohio 43201, USA*

<sup>5</sup>*Pathology Associates—A Charles River Company, Durham, North Carolina 27713, USA, and*

<sup>6</sup>*Laboratory of Computational Biology and Risk Analysis, National Institute of Environmental Health Sciences (NIEHS), Research Triangle Park, North Carolina 27709, USA*

## ABSTRACT

The NTP has a long history of using Fischer rats and has compiled a large database of incidences of lesions seen in control animals. Such a database is lacking for Harlan Sprague–Dawley (SD) rats. The intention of this paper is to report spontaneous lesions observed in female vehicle control Harlan SD rats, and to compare the incidence in 2 strains of rats (Fischer and Harlan SD) used in NTP studies. Female Harlan SD rats served as the test animals for a special series of 2-year studies. Male rats were not used in these studies. Complete histopathology was performed on all animals, and the pathology results underwent comprehensive NTP pathology peer review. The most commonly observed neoplasms in these female control Harlan SD rats were mammary gland fibroadenoma (71%), tumors of the pars distalis of the pituitary (41%) and thyroid gland C-cell tumors (30%). Female Fischer rats had incidences of 44% for mammary gland fibroadenomas, 34% for tumors of the pars distalis, and 16% for thyroid gland C-cell tumors. Fischer rats had a 15% incidence of clitoral gland tumors, while the Harlan SD rats had an incidence of <1%. In contrast to Fischer F344 rats, the Harlan SD rats had a high incidence of squamous metaplasia of the uterus (44.2%). Squamous metaplasia is not a lesion commonly observed in NTP control Fischer rats. The Harlan SD rats had a very low incidence of mononuclear cell leukemia (0.5%), compared with an incidence of 24% in female Fischer rats.

*Keywords.* Spontaneous Lesions; Harlan SD rats; 2-year study.

“The most commonly observed neoplasms in these female control Harlan Sprague–Dawley rats were **mammary gland fibroadenoma (71%)**, tumors of the pars distalis of the pituitary (41%) and thyroid gland C-cell tumors (30%).”

doi: 10.1080/01926230590961836

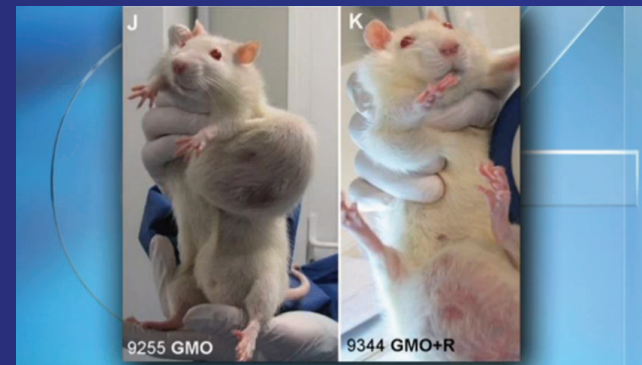
*Toxicol Pathol* June 2005 vol. 33 no. 4 477-483



# Sensational poorly-designed studies on small numbers of animals get huge media attention with no mention of the literally hundreds of other independent studies finding no effect of GE feed

(e.g. Seralini *et. al.* 2012 *Food Chem Toxicol* 50:4221–4231 - **RETRACTED**)

The publication of the 2012 S eralini et al. study claiming that Roundup™ Ready corn or the herbicide Roundup™ caused cancer in rats



“ Within hours, the news had been blogged and tweeted more than 1.5 million times. Lurid photos of tumor-ridden rats appeared on websites and in newspapers around the world, while larger-than-life images of the rats were broadcast across the USA on the popular television show Dr. Oz.

Activists destroyed a GM soybean consignment at the port of Lorient, France, in order to denounce the presence in the food chain of a product they considered to be toxic. The Russian Federation and Kazakhstan banned imports of the maize variety used in the study, Peru imposed a 10-year moratorium on GM crops and Kenya banned all imports of GM food.”

Arj  G. et al. 2013. *Transgenic Res.* 22:255-67.



**The publication of the Seralini article undermines the value of peer review, encouraging the plurality of opinion and democracy in science and promoting their influence on scientific policies.**



*"The Seralini paper, and its associated media fanfare, was a transparent attempt to discredit regulatory agencies around the world, and to get the public to insist on different standards of regulation for GM crops."*

Arjó G, Portero M, Piñol C, Viñas J, Matias-Guiu X, Capell T, Bartholomaeus A, Parrott W, Christou P. 2013. Plurality of opinion, scientific discourse and pseudoscience: an in depth analysis of the Seralini et al. study claiming that Roundup™ Ready corn or the herbicide Roundup™ cause cancer in rats. *Transgenic Res.* 22:255-67.





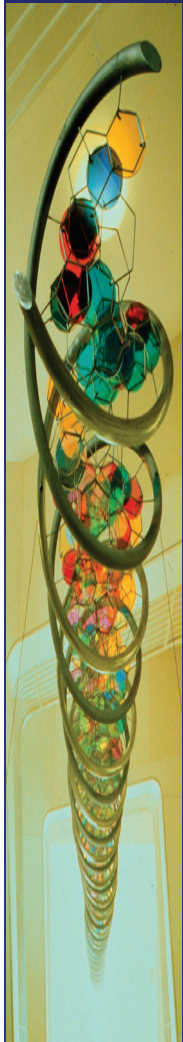


# Perhaps as concerning to public sector scientists is that the internet is being used to try to silence science-based dialog

Consider my last 5 peer-reviewed scientific publications:

- Van Eenennaam, A.L. 2013. (*Invited Chapter*) **Considerations related to breed and biological type. Chapter 3 in Heifer development in beef cattle.** D. J. Patterson and M. F. Smith *Eds.* Veterinary Clinics of North America: Food Animal Practice. 29:493–516.
- Van Eenennaam, A.L., K. A. Weigel, A. E. Young, M. A. Cleveland, and J. C. M. Dekkers 2014. **Applied Animal Genomics: Results from the Field.** Annual Review of Animal Biosciences. 2:105-139.
- Van Eenennaam, A.L., K. L. Weber, and D. J. Drake. 2014. **Evaluation of bull prolificacy on commercial beef cattle ranches using DNA paternity analysis.** Journal of Animal Science. 92:2693-701.
- Love, W. J., T. W. Lehenbauer, P. H. Kass, A. L. Van Eenennaam, and S. S. Aly. 2014. **Development of a novel clinical scoring system for on-farm diagnosis of bovine respiratory disease in pre-weaned dairy calves.** Peer J 2:e238.
- Van Eenennaam, A. L., and A. Young. 2014. **Prevalence and impacts of genetically engineered feedstuffs on livestock populations.** Journal of Animal Science. 92:4255-4278.





Inside An \$8 Billion Family Feud: Who Poisoned The Orkin Fortune?



The Most Interesting Man Revolutionizing The Health World



10 Calculated Risks That Lead To Startup Success

Alison Van Eenennaam | Log out

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# Van Eenennaam, A.L. and Young, A.E. 2014. Prevalence and impacts of genetically engineered feedstuffs on livestock populations. *Journal of Animal Science* 92:4255-4278.

Published October 1, 2014

<http://www.journalofanimalscience.org/content/92/10/4255.full.pdf>



Jon Entine  
Contributor

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I write skeptically about science, public policy, media and NGOs.

full bio

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SCIENCE & TECHNOLOGY 9/17/2014 @ 4:53PM | 331,410 views

## The Debate About GMO Safety Is Over, Thanks To A New Trillion-Meal Study

+ Comment Now + Follow Comments

Visit almost any anti-GMO website and you will find alarming headlines about the alleged dangers of GMO foods. They kill pigs, cows and sheep on farms and in lab studies! Humans are next!

“**Monsanto** **MON -1.54%**’s GMO Feed Creates Horrific Physical Ailments in Animals,” **screams** a typical article, in AlterNet, a popular anti-GMO site. It touts “new research” but as is typical of such articles and such sites, it neither quotes a study nor links to any independent research.

Although there have been more than **2,000 studies** documenting that biotechnology does not pose an unusual threat to human health and genetically modified foods are as safe or safer than conventional or organic foods, questions remain in the minds of many consumers.

**LARRY ELLISON**  
@Oracle OpenWorld  
Watch Keynote Highlights

HOVER TO WATCH

ORACLE



# This often results in personal attacks on scientists by groups who wish to silence sources to trigger a spiral of silence around an



- Dr. Ena Valikov** @beachvetlbc · Oct 9  
@edgeben @kevinfolta No it wasn't. There weren't a Billion Animals in "meta analysis" #Liar @BioBeef's Tweet: twitter.com/BioBeef/status...  
Expand
- Benjamin Edge** @edgeben · Oct 9  
@beachvetlbc @kevinfolta @BioBeef Is there a reason you key on the 49 day poultry instead of multi-year dairy info? Not long-term enough?  
Expand
- Alison Van Eenennaam** @BioBeef · Oct 10  
@edgeben @kevinfolta I do discuss the dairy data & also multiple long-term peer-reviewed controlled feeding studies - all show no effect  
Expand
- Cheryl A MacDonald** @HPofSD · Oct 10  
@BioBeef why didn't you include problems with this particular methodology? Advantages/Disadvantages? Most meta-an. do ? @edgeben @kevinfolta  
Expand
- Alison Van Eenennaam** @BioBeef · Oct 10  
@HPofSD @edgeben @kevinfolta read the paper U will see I do discuss limitations of field data sets and confounding variables of genetics/env  
Expand
- Kevin Folta follows
- Dr. Ena Valikov** @beachvetlbc · Oct 10  
@BioBeef @HPofSD @edgeben @kevinfolta Didn't discuss antibiotic use in context of SCC/ growth promotion. Typical @MonsantoCo #LIAR
- GMO SF** @GMO SF · Oct 9  
@beachvetlbc You still are giving no logical arguments why you think Dr Van Eenennaam has no credibility! Can you not articulate? @edgeben  
Expand
- Kevin Folta** @kevinfolta · Oct 9  
@GMO SF @beachvetlbc @edgeben This is why scientists don't engage. It is not worth the abuse.



Trying to discuss scientific studies in 140 characters is scientific Tourette's syndrome

#Not enough room to discuss complex topics!

Back to Album · GMO Free USA's Photos · GMO Free USA's Page Previous · Next

## VAN EENENNAAM REVIEW PAPER OF ANIMAL FEEDING STUDIES MARRED BY BIAS & SCIENTIFIC SHORTCOMINGS

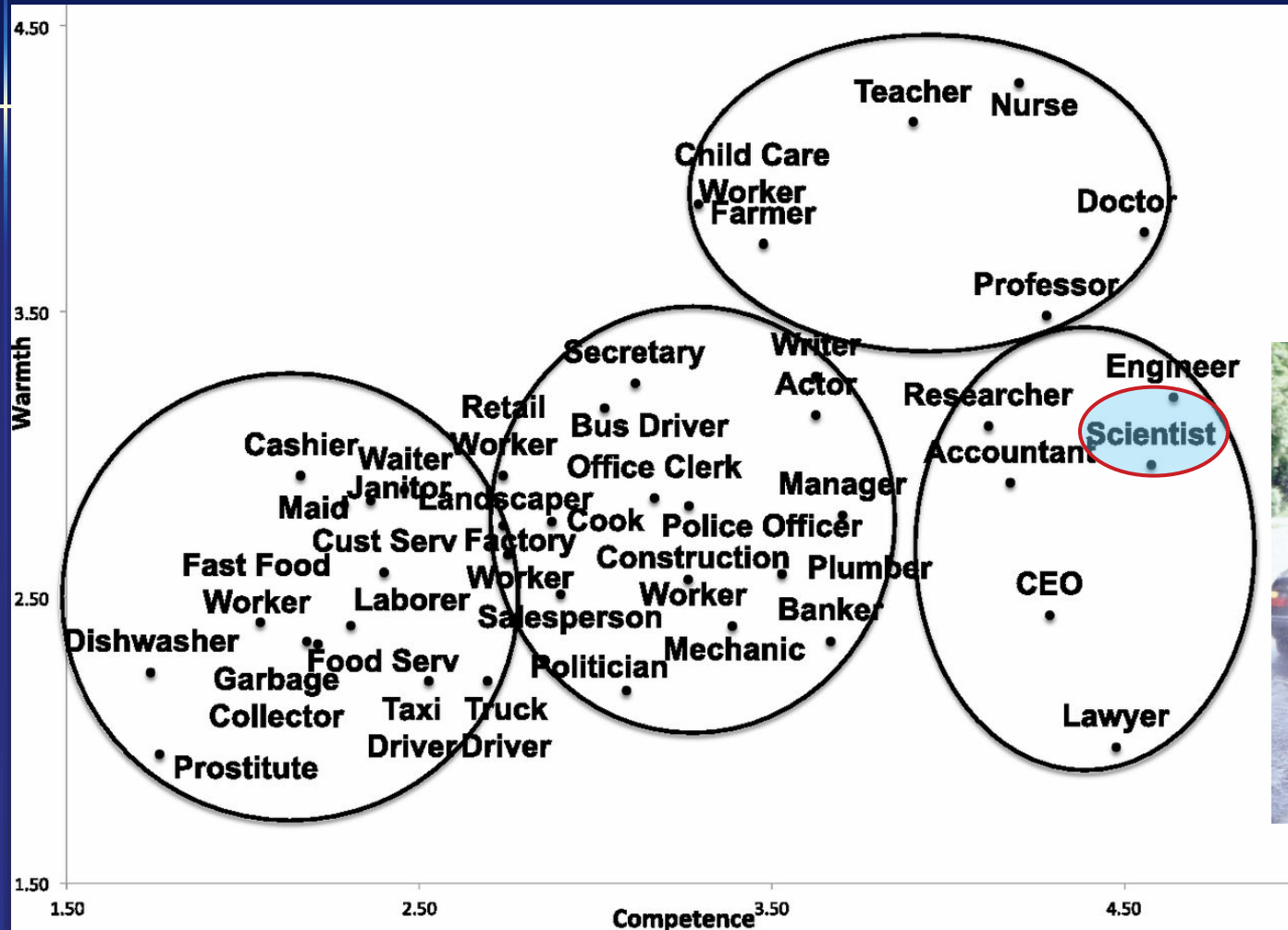


The Van Eenennaam and Young review of animal feeding studies, trotted out by the pro-GMO skills, is being touted as showing that GMOs are safe. After examination, we find the review paper is nothing more than crafted propaganda, published to sway public opinion and policy as awareness and rejection of GMOs grows.

**THERE IS NO CONSENSUS ON THE SAFETY OF GMOS.**



# Scientists have earned the respect of Americans but not necessarily their trust. But this gap can be filled by showing concern for humanity and the environment.



Fiske S T , and Dupree C 2014. Gaining trust as well as respect in communicating to motivated audiences about science topics. PNAS 111:13593-13597



Hot on the trail to  
what's really in

# INVESTIGATE YOUR FOOD

Food Babe



Hot on the trail to  
who's really giving you

# INVESTIGATE "FACTS"

What do the facts say? YouTube Video  
<http://www.youtube.com/watch?v=Ihh0t-y86Xk>





# Thanks for inviting me

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Animal Biotechnology and Genomics  
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[alvaneennaam@ucdavis.edu](mailto:alvaneennaam@ucdavis.edu)



**UCDAVIS**  
**ANIMAL SCIENCE**

<http://animalscience.ucdavis.edu/animalbiotech>

