Thank you to webinar speaker, Mary Lee Chin, MS, RD, who provided the responses to the questions below.

GMO Webinar Participant Questions:

How about newer technology that doesn't involve gene insertion but is about turning a gene on/ off ...isn't that still considered GE/GMO?

http://gmo.geneticliteracyproject.org/FAQ/how-are-governments-regulating-crispr-and-new-breeding-technologies-nbts/

Rapid advancements in the field of biotechnology have left governments around the world scrambling to figure out how, or if, new breeding technologies (NBTs) should be regulated. Much of the criticism of GMOs, and much of the regulation developed 20-30 years ago, focused on transgenics in which genetic material from unrelated species are added to create new traits in a plant or animal.

Newer breeding techniques offer scientists an easier way to do cisgenic breeding—involving no "foreign" DNA—allowing the development of new plant and animal varieties. NBTs like CRISPR/Cas9, TALENs and ZFN do not fit neatly into the GMO definitions crafted by the various regulatory agencies around the world. Its proponents say gene editing is similar to mutagenesis, which is not regulated (there are hundreds of mutagenized crops sold as organic), but faster and more precise. The regulatory process remains fluid. The US Department of Agriculture determined in April 2016 that it would not regulate a mushroom and a new type of corn genetically modified with the gene-editing tool CRISPR–Cas9, making them the first CRISPR-edited crops to be approved by the US government. According to the agency's Animal and Plant Health Inspection Service (APHIS), these crops—and about 30 other plants they've reviewed—do not qualify as something the agency must regulate. (Once a crop passes the USDA reviews, it may still undergo a voluntary review by the US Food and Drug Administration.)
Biotechnology critics call NBT's "hidden GMOs" and examples of "extreme engineering", and are pushing to regulate them under a general GMO umbrella, while biotechnology supporters believe that regulating them as GMOs would cripple innovation.

Is 20 years long enough to assess long term impacts of GMO/GE foods? ie children growing up consuming these are only 25 years old...

https://www.geneticliteracyproject.org/2016/01/13/no-long-term-gmo-studies-humans/

"Researchers examine safety when there's a plausible mechanism whereby harm can occur. For example, a cholesterol lowering drug may act by interfering with cholesterol synthesis in the liver, so it may make sense to see if it impacts other metabolic functions in the liver. But when it comes to the traits that are introduced into GE crops, there isn't really a mechanism of harm: for example, the Arctic Apple is engineered to have a gene turned off, and the gene doesn't even exist in humans, so how could that harm us? This is why most scientists wouldn't want to spend years trying to secure grants for a long

term feeding study when the likelihood of having an important discovery or contribution to the field is so low. Safety is relative, and there have been many long-term feeding studies in animals which haven't observed any harm, suggesting that follow-up testing of GE crops in humans is unnecessary.

An additional issue is that the experimental design would be incredibly difficult. Unlike animal feeding studies, you cannot control for other dietary factors or for lifestyle of the humans in the study.

Then, we have to figure out the duration of our experiment: how long will these people have to eat Bt-corn to get this unknown effect? One year? Two years? Five? 10**?**

Then we have to figure out who we will be feeding: will we focus on individuals of a single genetic background to eliminate other variables? Will we include children? Pregnant women?

Next, we'd have to grow all the corn in the same place: studies have shown that geographic and seasonal variability changes the nutritional content of crops more than whether the crop is a GMO or not.

Then, we have to decide how much corn they'd need to eat in order to observe this unknown effect. One ear a week? A day? Who would sign up for a study eating an ear of corn a day for a year?? And then who is going to pay for this one-year study on many people of organic food consumption plus GE-corn? If Monsanto or other seed developers pay for it, will anyone trust the data?

There are FDA guidelines for examining the impact of food additives in humans has several important points including this one:

> *"A food or food additive generally will be considered suitable for clinical testing if the substance is unlikely to produce significant toxic effects at the levels to which the subjects of the clinical study will be exposed. This usually is determined from the results of toxicity studies in animals or by examining existing data on population exposure. However, in cases where the type of toxic response associated with the consumption of a food or food additive by experimental animals is judged to be severe, exposure of subjects in clinical studies to the additive may need to be significantly below the level found to produce no toxic effects in an appropriate species."*

If the individuals who want to do long-term feeding studies in humans are looking for evidence of harm due to "long term toxic effects", then based on the statement above from the FDA, such studies would never be cleared by an ethics panel. Other important points from the document include the fact that such studies should have different dosages and the language used for long-term studies is weeks/months, not years.

If we're looking for a harmful effect but don't know what it is because we don't have a reasonable mechanism whereby harm may occur, how can you design the experiment? What variables will you measure? As this document from the FDA outlines, clinical trials for drugs go through very specific phases and can be variable in duration and size. The

final point is this: what is exclusive or unique about GMOs that merits such rigorous testing, yet excludes other crop modification techniques?"

I have understood for a while that GMOs are not harmful to human health. What about environmental concerns? Not only the possibility that GMOs have contributed to the decline in bee populations (and other similar issues), …

https://gmoanswers.com/ask/why-it-killing-bees

The scientific community recognizes that bee health is a very complex issue. In fact, a report from the proceedings of the U.S. National Academy of Sciences indicated that bees may be dying not from a single toxin or disease, but rather from a variety of factors that include introduced pests and parasites, microbial diseases, inadequate diet and loss of genetic diversity. In its assessment of neonicotinoid insecticides, the Environmental Protection Agency stated that it "is not aware of any data indicating that honey bee declines or the incidence of CCD [colony collapse disorder] in the U.S. is correlated with the use of pesticides in general or with the use of neonicotinoids in particular." Modern seed treatments reduce the amount of insecticides in the environment and target pesticides only at the insects that are actually feeding on food crops, thus protecting other, often beneficial insects, including bees. Moreover, even though seed treatments make neonicotinoids part of the plant, the amount reaching bees in pollen grains is extremely tiny and not thought to be a factor in CCD or bee mortality.

….but they discourage better agricultural practices that lead away from the problems inherent in monocropping. ….

https://www.biofortified.org/2014/08/do-gmo-crops-foster-monocultures/

Do GMO crops "foster monocultures?"

by Steve Savage | posted in: Science | 7 Comments

Corn harvest, from United Soybean Board

Do GMO crops "foster monoculture?" This is a frequent criticism of modern agriculture. I have three problems with it:

"Monoculture" isn't the right term to use to describe the relevant issues – its really about a limited crop rotation

History and economics are the drivers behind this phenomenon, not crop biotechnology

The solutions – to the extent that they are needed – are not what most critics seem to imagine

The Corn Belt of the Midwestern US, is a multi-million acre farming region almost entirely dominated by just two crops – corn and soybeans. This phenomenon is often termed "monoculture," but monoculture is merely the practical approach of growing a single crop in a given field. The opposite of monoculture is "polyculture" and it is entirely impractical for even minimally mechanized farming.

The Corn Belt is more accurately described as an example of a "limited crop rotation." The typical pattern is an alternation between corn and soybeans in each field. There are also some fields where the growers plant continuous corn or continuous soybeans.

There are many reasons that a more "diverse crop rotation" could be a good idea. Mixing up crop types over time can help build soil quality because of different rooting patterns or residue characteristics. Some plant pests can be more easily managed if their life cycles are disrupted by cropping changes. All of this is well known, but for a variety of reasons that I'll discuss below, the less diverse rotation persists.

Corn and soybeans happen to be crops which involve widespread use of biotech crop options, but there are many other farming areas with a narrow crop rotation where "GMO" options have never been available. There are areas in Northern Europe where "continuous wheat" is the norm and many premium wine regions where essentially only grapes are grown. If farmers somewhere are not using a diverse crop rotation – there is a rational explanation involving history, economics, and risk management.

…. **Whatever your feelings on environmental concerns, sustainability is a growing consumer issue.**

and

……What do we tell consumers concerned about sustainability?

1. https://www.cambridge.org/core/journals/environment-and-development-economics/article/div-classtitlethe-impact-of-agricultural-biotechnology-on-supply-and-land-usediv/95DE94FB6AAA97236E05CBAC931BAE9A
   The impact of agricultural biotechnology on supply and land-use: We find that altogether, GE saved 13 million hectares of land from conversion to agriculture in 2010, and averted emissions are equivalent to roughly one-eighth of the annual emissions from automobiles in the US.
2. A Meta-Analysis of the Impacts of Genetically Modified Crops. Wilhelm Klümper, Affiliation Department of Agricultural Economics and Rural Development, Georg-August-University of Goettingen, Goettingen, Germany.
   http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111629

   Background

   Despite the rapid adoption of genetically modified (GM) crops by farmers in many countries, controversies about this technology continue. Uncertainty about GM crop impacts is one reason for widespread public suspicion.

   Objective

   We carry out a meta-analysis of the agronomic and economic impacts of GM crops to consolidate the evidence.

   Study Eligibility Criteria

   Studies were included when they build on primary data from farm surveys or field trials anywhere in the world, and when they report impacts of GM soybean, maize, or cotton on crop yields, pesticide use, and/or farmer profits. In total, 147 original studies were included.

   Conclusion

   The meta-analysis reveals robust evidence of GM crop benefits for farmers in developed and developing countries. Such evidence may help to gradually increase public trust in this technology.

Also, a similar question:
I agree that there are likely no ill-effects of consuming a GMO food. Many concerns for people against GMOs are not for the GMO foods themselves, they are for the farming practices that typically go side-by-side. Can the speakers comment on the resulting systematic public health issues that typically result from the use of GMO crops (e.g increased monoculture leading to reduced soil quality; increased use of pesticides that have poor human health effects).

https://www.ncbi.nlm.nih.gov/pubmed/27253265
GM Crops Food. 2016 Apr 2;7(2):84-116. doi: 10.1080/21645698.2016.1192754. Epub 2016 Jun 2.

Environmental impacts of genetically modified (GM) crop use 1996-2014: Impacts on pesticide use and carbon emissions. Brookes G1, Barfoot P1.

Abstract

This paper updates previous assessments of important environmental impacts associated with using crop biotechnology in global agriculture. It focuses on the environmental impacts associated with changes in pesticide use and greenhouse gas emissions arising from the use of GM crops since their first widespread commercial use in the mid 1990s. The adoption of GM insect resistant and herbicide tolerant technology has reduced pesticide spraying by 581.4 million kg (-8.2%) and, as a result, decreased the environmental impact associated with herbicide and insecticide use on these crops (as measured by the indicator, the Environmental Impact Quotient [EIQ]) by18.5%. The technology has also facilitated important cuts in fuel use and tillage changes, resulting in a significant reduction in the release of greenhouse gas emissions from the GM cropping area. In 2014, this was equivalent to removing nearly 10 million cars from the roads.

Re: **increased use of pesticides that have poor human health effects).**
https://www.usda.gov/topics/biotechnology/biotechnology-frequently-asked-questions-faqs

In terms of improved weed control, herbicide-tolerant soybeans, cotton, and corn enable the use of reduced-risk herbicides that break down more quickly in soil and are non-toxic to wildlife and humans. Herbicide-tolerant crops are particularly compatible with no-till or reduced tillage agriculture systems that help preserve topsoil from erosion.

Please discuss the potential of GMO salmon contaminating wild salmon. Is this a possibility? a potential concern?

https://www.biofortified.org/2015/11/gmo-salmon/

"The FDA has finally released their decision about fast-growing, genetically engineered salmon. They state: "After an exhaustive and rigorous scientific review, FDA has arrived at the decision that AquAdvantage salmon is as safe to eat as any non-genetically engineered (GE) Atlantic salmon, and also as nutritious." It may be safe to eat, but the remaining question is whether wild fish could be at risk from GMO salmon. …

…very specific about how and where the fish would be raised. The request was for one specific egg production facility in Canada and one specific fish production facility in Panama. The FDA's approval is for these locations only, and a new approval would be needed for any new locations. Aqua Bounty selected these locations to have many overlapping ways to prevent release of GMO salmon into the environment. Aqua Bounty explains these containment methods in the environmental assessment that they submitted to the FDA. The containment methods are biological, physical, and environmental.

Biological containment

The most important way to prevent AquAdvantage salmon from breeding with wild salmon is to use only fish that can not breed (sterile fish)... Aqua Bounty has reduced the risk of fertile fish escaping by using only female fish.

Physical containment

Because a small percentage of AquAdvantage salmon could be capable of reproduction, additional containment methods are necessary. At both egg and fish production facilities, multiple layers of security will reduce risk of human sabotage. These include on-facility living quarters for security personnel, security cameras, and 8' chain link fencing around each property, among other measures. Both facilities use numerous layers of nets, screens, and filters. … Still, it's possible that the physical containment could fail (such as

if a facility wasn't maintained and all the nets and filters and screens failed) and release additional fish.
Environmental containment
In the highly unlikely case that a fertile AquAdvantage salmon escaped, Aqua Bounty has taken additional steps to further reduce the risk that any escaped fish could breed with sexually compatible male fish nearby. The egg production facility is located in Prince Edward Island, Canada. The physical containment measures mean very few eggs could make it to nearby bodies of water. ..In the winter, temperatures in bodies of water near the facility are too low for salmon. Barriers to migration would prevent any escaped fish from moving out to sea during the summer. The eggs are raised in fresh water, and the relatively high salinity in the nearby river would further reduce likelihood of survival…
Worst case scenario
The multiple levels of containment makes it very unlikely that any AquAdvantage salmon could escape into the wild. However, despite all containment efforts, less than 1% of AquAdvantage salmon could escape from the rearing facility and, on average, 2% of the salmon will be diploids. Worst case scenario, that means 0.0002% of all fish reared (2 fish in every 10,000) could be fertile females that escape. These fish then face additional barriers to reproduction and spread of the gene that makes them grow faster than wild fish…More studies are needed on survival rates of fast growing vs wild type and on mixed populations, but research so far indicates low risk of harm…""

Questions unanswered:

How has it been shown that the GM vs non GM products are not any different, including animals that have eaten GMO feed?

https://www.animalsciencepublications.org/publications/jas/articles/92/10/4255

Journal of Animal Science in the largest study ever conducted, Alison Van Eenennaam and Amy E. Young, geneticists with the Department of Animal Science at the University of California-Davis, reviewed 29 years of livestock productivity and health data from both before and after the introduction of GE animal feed. The field data represented more than 100 billion animals.
There were no indications of any unusual trends in the health of animals since 1996 when GMO crops were first harvested. The authors also address the implications of their study on human health. No study has revealed any differences in the nutritional profile of animal products derived from GE-fed animals. 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.
Van Eenemmaam AL. GMOs in animal agriculture: time to consider both costs and benefits in regulatory evaluations. Journal of Animal Science and Biotechnology. 2013;4(37).

I thought that the GMO papaya was developed in Hawaii?

http://www.gmo-compass.org/eng/grocery_shopping/fruit_vegetables/14.genetically_modified_papayas_virus_resistance.html

In the late 1980s, the University of Hawaii began developing a papaya cultivar resistant to Papaya Ringspot Virus. To do this, certain viral genes encoding capsid proteins were transferred to the papaya genome. These viral capsid proteins elicit something similar to an "immune response" from the papaya plant. These new, genetically modified papaya plants are no longer susceptible to infection, allowing farmers to cultivate the fruit even when the virus is widespread.
The first virus resistant papayas were commercially grown in Hawaii in 1999.
Transgenic papayas now cover about one thousand hectares, or three quarters of the total Hawaiian papaya crop.
Genetically modified papayas are approved for consumption both in the US and in Canada. Several Asian countries are currently developing transgenic papaya varieties resistant to local viral strains.
At this point, GM papayas are not approved in the EU. Until now, no application for approval has been submitted. Therefore, importing and marketing genetically modified papayas is not permitted in the EU.
http://www.genengnews.com/best-of-the-web/gmo-compass/2708 (Description of GMO Compass)

Can you address the issue of genetic drift and risk to organic farmers -- in other words the difficulty of "co-existence." Organic farmers have lost markets and economic benefits due to genetic contamination. The GE industry provides no protection to farmers who have lost crops due to drift.

1. Guidelines for Co-existence: https://www.usda.gov/sites/default/files/documents/coexistence-corn-factsheet.pdf
2. http://ohioline.osu.edu/factsheet/agf-153
   Peter Thomison and Allen Geyer, Department of Horticulture and Crop Science
3. http://world-food.net/download/journals/2003-issue_2/j2-agriculture-99.pdf
   Can GM and non-GM crops coexist? Setting a precedent in Boulder County, Colorado, USA P.F. Byrne1* and S. Fromherz2

Can I get the names of the glyphosate reports again?

1. IARC Reporthttps://www.iarc.fr/en/media-centre/iarcnews/pdf/MonographVolume112.pdf
2. Conclusion on the peer review of the pesticide risk assessment of the active substance glyphosate **https://www.efsa.europa.eu/en/efsajournal/pub/4302**
3. Joint FAO/WHO Meeting on Pesticide Residues (JMPR)**http://www.who.int/foodsafety/areas_work/chemical-risks/jmpr/en/**
   http://www.fao.org/3/a-i5693e.pdf

If glyphosate does not cause cancer, please explain the recently released reports regarding Monsanto hiding faking and personally writing their reports while collaborating with the EPA.

Unfortunately I am not familiar with what this refers to.

I believe Ruth mentioned the status of the GMO labeling ruling passed by Obama. Is there any update on the timeline w/ the new administration?

There is no clear timeline on a confirmation process for USDA nominee Sonny Perdue – the last cabinet choice to be made – so everyone recognizes it will take some time. (Confirmation hearings for former Georgia governor Sonny Perdue are expected to begin Thursday, March 23.)

Under the Trump Administration there is a government-wide 60-day freeze on rules that have yet to go into effect, so Perdue will have to decide what to do about regulations the Obama administration introduced to get the national disclosure standard for GMO ingredients moving. There is still a lot to do before it's released by July 29, 2018, the deadline set by Congress.

It is difficult to speculate about what will happen with the labeling bill, just as it is with other Ag programs. https://www.bna.com/outlook-trump-brings-n73014449946/

The Coalition for Safe and Affordable Food (http://coalitionforsafeaffordablefood.org/) has met with the Trump USDA landing team in February on the importance of promulgating regulations and urges for a rulemaking process that concludes by mid-2018as intended by Congress.

Refers to: NATIONAL BIOENGINEERED FOOD DISCLOSURE STANDARD https://www.ams.usda.gov/sites/default/files/media/Final%20Bill%20S764%20GMO%20Discosure.pdf

Do you have any comment about the GMO law in VT?

Passage of the **National Biotech Disclosure Law** bill and its signing into law by President Obama immediately ended the state-by-state patchwork of different state GMO labeling mandates

Dr. Collins: what is best way to get omega 3 F.A. in sufficient amounts for health /wellness?

http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/HealthyDietGoals/Fish-and-Omega-3-Fatty-Acids_UCM_303248_Article.jsp#.WNB-NoWcFfE

The American Heart Association recommends eating fish (particularly fatty fish) at least two times (two servings) a week. Each serving is 3.5 ounce cooked, or about ¾ cup of flaked fish. Fatty fish like salmon, mackerel, herring, lake trout, sardines and albacore tuna are high in omega-3 fatty acids.

Increasing omega-3 fatty acid consumption through foods is preferable. However, those with coronary artery disease, may not get enough omega-3 by diet alone. These people may want to talk to their doctor about supplements. And for those with high triglycerides, even larger doses could help.

Patients taking more than 3 grams of omega-3 fatty acids from capsules should do so only under a physician's care. High intakes could cause excessive bleeding in some people.

Eating fish, is there a catch? Some types of fish may contain high levels of mercury, PCBs (polychlorinated biphenyls), dioxins and other environmental contaminants. Levels of these substances are generally highest in older, larger, predatory fish and marine mammals.

The benefits and risks of eating fish vary depending on a person's stage of life.

Children and pregnant women are advised by the U.S. Food and Drug Administration (FDA) to avoid eating those fish with the potential for the highest level of mercury contamination (e.g., shark, swordfish, king mackerel or tilefish); to eat up to 12 ounces (two average meals) per week of a variety of fish and shellfish that are lower in mercury (e.g., canned light tuna, salmon, pollock, catfish); and check local advisories about the safety of fish caught by family and friends in local lakes, rivers and coastal areas.
For middle-aged and older men and postmenopausal women, the benefits of fish consumption far outweigh the potential risks when the amount of fish are eaten is within the recommendations established by the FDA and Environmental Protection Agency. Eating a variety of fish will help minimize any potentially adverse effects due to environmental pollutants.
Five of the most commonly eaten fish or shellfish that are low in mercury are shrimp, canned light tuna, salmon, pollock, and catfish. Avoid eating shark, swordfish, king Mackerel, or tilefish because they contain high levels of mercury.

We are told the GMOs reduce pesticide use, but we have seen a sharp increase in glyphosate use and now 2,4-D and Dicamba will be used due to resistant weeds. Can you address environmental contamination?

http://www.pantagraph.com/business/farming/dicamba-and-soybean-what-to-expect-in/article_f46c73c3-7177-5778-b282-548f847644ea.html

Dicamba and soybean: What to expect in 2017

LAUREN QUINN University of Illinois Extension

URBANA – A barrier to weed control on soybean farms has been lifted after the Environmental Protection Agency approved a label allowing use of the herbicide dicamba in dicamba-resistant soybean, although only one commercial product received that label.
Many Illinois farmers anticipate this technology will provide a much-needed method to control weeds that are resistant to multiple herbicides, as well as other difficult-to-control species.
“Without question, there are instances and scenarios in which dicamba will improve control of certain weed species, but dicamba will not bring back the ‘good ol’ days’ of post-only weed control programs in soybean. Current expectations of what this technology can accomplish tend to be a bit more optimistic than what the technology actually will be able to deliver,” said University of Illinois weed scientist Aaron Hager.
Hager expects the technology will work well in a handful of scenarios. For example, dicamba should be effective for glyphosate-resistant horseweed (i.e., marestail) that does not respond to the traditional burn-down tank mix of glyphosate and 2,4-D.
“The new dicamba label allows up to 1 lb. dicamba acid-equivalent to be applied prior to planting dicamba-resistant soybean. This can provide better and more consistent control of glyphosate-resistant horseweed compared with 0.5 lb acid-equivalent 2,4-D,” Hager said.
Although the new label allows soybean to be planted immediately after dicamba application, Hager advised farmers to wait a few days following application before injuring the weeds with the planting operation.
Hager also predicted that dicamba will provide good control of tall and ivy-leaf morning glory, as well as common and giant ragweed. “Dicamba certainly can provide better control of herbicide-resistant ragweeds than can glyphosate or ALS inhibitors,” he said.
For farmers battling waterhemp, the solution may not be as simple. Most university weed control guides list dicamba as good or very good on waterhemp, but not excellent.

"Dicamba can improve control of pigweed species, but it will never be as effective as glyphosate once was," Hager noted. "Illinois farmers have made great strides toward utilizing more diverse herbicide programs for waterhemp control than they were using a decade ago. We suggest that dicamba should be used in a way that does not reduce this diversity. It is imperative to maintain a diverse weed management approach to prolong the effective utility of dicamba."
Illinois waterhemp populations have evolved resistance to herbicides from six site-of-action groups. According to Hager, resistance to dicamba is not a question of "if" but "when."
Hager pointed out some of the restrictions that come with the new dicamba label. "The current label contains several mandates related to the actual spray application procedure that are somewhat unique," he said. "For instance, there are limitations on boom height, sprayer speed, and nozzle type that applicators must follow."

http://npic.orst.edu/factsheets/dicamba_gen.html
http://npic.orst.edu/factsheets/dicambahttp://npic.orst.edu/factsheets/dicamba_gen.html_gen.html

Is there a relationship between glyphosate and gluten intolerance/celiac disease?

This report has been repeatedly debunked and the claim that GMOs are somehow linked to celiac disease has been challenged by the Celiac Disease Foundation itself.

https://www.geneticliteracyproject.org/2016/12/15/do-genetically-modified-foods-cause-gluten-allergies/
The claims can be traced to an obscure essay, "Glyphosate, pathways to modern diseases II: Celiac sprue and gluten intolerance," published in 2014 in a Slovakian predatory 'pay for play' journal by two scientists—MIT computer researcher Stephanie Seneff and Anthony Samsel, who identifies himself as an "independent scientist and consultant". Neither has any known expertise in genetics or toxicology. They speculated that trace exposures to the common herbicide glyphosate, which is used in conjunction with some GMOs, could account for what they claim is a rise in celiac disease and gluten intolerance.

And the issue with these crops contaminating wild and farmed plants of the same type or same family with cross pollination.

https://www.usda.gov/topics/biotechnology/biotechnology-frequently-asked-questions-faqs
Crops produced through genetic engineering are the only ones formally reviewed to assess the potential for transfer of novel traits to wild relatives. When new traits are genetically engineered into a crop, the new plants are evaluated to ensure that they do not have characteristics of weeds. Where biotech crops are grown in proximity to related plants, the potential for the two plants to exchange traits via pollen must be evaluated before release. Crop plants of all kinds can exchange traits with their close wild relatives (which may be weeds or wildflowers) when they are in proximity. In the case of biotech-derived crops, the EPA and USDA perform risk assessments to evaluate this possibility and minimize potential harmful consequences, if any.
USDA researchers monitor for potential environmental problems such as insect pests becoming resistant to Bt, a substance that certain crops, such as corn and cotton, have been genetically engineered to produce to protect against insect damage. In addition, in

partnership with the Agricultural Research Service (ARS) and the Forest Service, the Cooperative States Research, the National Institute of Food and Agriculture (NIFA) administers the Biotechnology Risk Assessment Research Grants Program (BRAG) which develops science-based information regarding the safety of introducing genetically engineered plants, animals, and microorganisms.

Other potential risks considered in the assessment of genetically engineered organisms include any environmental effects on birds, mammals, insects, worms, and other organisms, especially in the case of insect or disease resistance traits. This is why the USDA's Animal and Plant Health Inspection Service (APHIS) and the EPA review any environmental impacts of such pest-resistant biotechnology derived crops prior to approval of field-testing and commercial release. Testing on many types of organisms such as honeybees, other beneficial insects, earthworms, and fish is performed to ensure that there are no unintended consequences associated with these crops.

Lists of biotechnology research projects can be found at https://www.ars.usda.gov/research/projects.htm for ARS and at https://www.nifa.usda.gov/funding-opportunity/biotechnology-risk-assessment-research-grants-program-brag for NIFA.