GMO 2.0: Science, Society and the Future
Overview of Risks and Benefits of Genetically Engineered Crops

Paul Vincelli
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List of all industry funding received for GE work (=GMOs)
Genetically engineered crops in the USA

**Agronomic crops**
- Alfalfa
- Canola
- Field corn
- Cotton
- Soybean
- Sugar beet

**Horticultural crops**
- Apple (Arctic™)
- Sweet corn
- Papaya
- Pineapple (‘Rosé’™)
- Potato (‘Innate’™)
- Yellow squash
A genetic duplication in tomato

Genetic engineering is often not the best breeding approach.

Was the DNA modified?

Susceptible

Disease-resistant, from conventional breeding

Was the DNA modified?
Word processing: an analogy for genetic engineering
Imagine this sentence is a gene.

Tomato was added to the focaccia in the late 18th century.
Plant transformation

Copy and paste

1. Cut tomatoes in half.
2. Squeeze out the seeds.
3. Grate tomato flesh into a bowl.
4. Discard skins...
1. Cut tomatoes in half.
2. Squeeze out the seeds.
3. Grate tomato flesh **Tomato was added to the focaccia in the late 18th century.** into a bowl.
4. Discard skins...
Credit – Vincent Colantonio; M.S. - Molecular Biology, Microbiology, and Biochemistry
Springfield, Illinois
Non-GMO breeding is less precise, less controlled, more disruptive

And that is OK!

Citations at https://vincelliblog.wordpress.com/2016/05/30/conventional-breeding-creates-safer-foods-than-genetic-engineering-fact-or-assumption/
Genetic change: What matters is...

Not how it was **made**
But what it **does**
Are GE crops safe to eat?
DNA in our food?

If I eat a banana, will I become a banana?
Doesn’t represent scientific findings

https://www.geneticliteracyproject.org/2015/02/10/the-original-frankenfoods/
Consumption of Genetically Engineered (GMO) Crops: Examples of Quotes from Position Papers of Scientific Organizations

Paul Vincelli
University of Kentucky
Dated 20 Dec 2017


Individual traits might pose risk (also true for non-GMO plants)...

...but there is no intrinsic mechanism of harm from genetic engineering
Genetic change: What matters is…

Not how it was **made**
But what it **does**
Concern: Transgene flow

Transgenic crop → Pollen flow → Nontransgenic wild or weedy relatives and hemizygous transgenic F1 hybrids → Hybridization, growth. (Repeat...)

Kojonup farmers caught in epic legal battle over genetically modified canola contamination

By Belinda Hawkins

It started in the West Australian wheat belt with tense words between neighbours at a community working bee.

It ended up in a "genetically modified (GM) versus organic" court battle that made headlines around the world.

And next week, there will be a further chapter in the WA Supreme Court.

Speaking out for the first time in interviews for tonight's Australian Story, family members from the opposing sides have described the intense emotional impact of the legal battle.

PHOTO: Michael Baxter has fought a protracted legal fight with his neighbour over his use of genetically modified canola.
(Australian Story: Belinda Hawkins)

Concern: GE crops promote corporate ownership of food supply
Some examples of GE
Roundup-Ready® corn

Active ingredient = glyphosate
Aspergillus, Aflatoxins

Rat livers injected with increasing doses of aflatoxin B1. Upper left=aflatoxin-free control. http://poisonousplants.ansci.cornell.edu/toxicagents/aflatoxin/aflatoxin.html
Aflatoxin reduction by gene silencing

Bt brinjal in Bangladesh

20 farmers in 2014
25,520 farmers in 2018

Disease-resistant tomato with a single gene from pepper
Bacterial wilt of banana

Staple food for 100,000,000 people in Eastern Africa

http://www.promusa.org/Xanthomonas+wilt
http://r4dreview.org/2008/09/the-future-of-african-bananas/
http://www.asareca.org/content/regional-efforts-control-banana-wilt-disease
Control of bacterial wilt of banana

GMO (Hrap or Pflp from pepper)

Ugandan scientists research GE solutions to bacterial wilt of banana (US-AID funded)
Field trial of BW-resistant banana in Uganda

http://allianceforscience.cornell.edu/blog/gm-bxw-resistant-bananas-start-their-journey-farmer
Case by case