Where to go from here?

- Each crop, each "trait" (modification) needs to be evaluated separately.

- We need more agricultural research
  - To understand how to combat pests and disease
  - To move towards sustainable practices

- Lets have more fun runs for agriculture!

Not all GMOs are created equal and must be tested.

Before release into the environment, GM crops are subject to risk-assessment and risk-management measures to evaluate:

- Risks to human health (including toxicity and allergenicity)
- Risks of evolution of resistance in target pathogens or pests
- Risks to non-target organisms
- Risks from movement of transgenes

Banning GMOs is not the answer to:

- Corporate control of the food and political systems
- Monoculture:
  https://geneticliteracyproject.org/2016/04/11/monocultures-great-evil-gmos-modern-ag/
- Impact of farming and agriculture on the environment.
- Real or perceived rises in the rates of certain diseases.

- Let's be passionate about the truth
- Don't accept everything you hear!
- Adhere to a scientific approach with important questions:
  - Are GMOs safe in your foods?
  - Are they actually in your foods!?!
  - Are GMOs better or worse for the environment?
  - Are GMOs potentially helpful to the future of agriculture?
  - Will GMOs put non-GE farmers out of business?
- Not all GMOs are the same!

More information:

My lab website:
https://sites.biochem.umass.edu/vierlinglab/genetically-modified-plants/

My E-mail address:
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Safety regulators in the U.S.

FDA: U.S. Food and Drug Administration

- Determines if it is safe to eat

EPA: U.S. Environmental Protection Agency

- Determines if it is safe for the environment

USDA: U.S. Department of Agriculture

- Determines if it is safe to grow

Info on Herbicide use:

http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Chemical_Use/2014_Corn_Highlights/#pesticide

Table 2. Top Herbicides Applied to Corn Planted Acres, 2014 Crop Year [a]

Active Ingredient	% of Planted Acres	Avg. Rate for Year (lbs/acre)	Total Applied (mil lbs)
Atrazine	55	1.018	45.2
Glyphosate isopropylamine salt	38	0.889 [b]	27.2 [b]
Acetochlor	29	1.256	28.7
Mesotrione	27	0.115	2.5
S-Metolachlor	27	1.106	23.6
Glyphosate potassium salt	24	1.159 [b]	22.6 [b]

INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS

http://www.isaaa.org

Center for Environmental Risk Assessment

- About Us
- GM Crop Database
- Bibliography Database
- CERA Meetings & Events
- CERA Publications
- S. Asia Biosafety Program

http://cera-gmc.org/

The Center for Environmental Risk Assessment (CERA) is dedicated to developing and applying sound science to the environmental risk assessment of agricultural biotechnologies so their contributions to the sustainable production of food, fuel and fiber may be safely realized.

2016 Report:

The National Academies of Science, Engineering and Medicine

Reviewed >20 years of GMO data since GMOs, ~900 studies, and European and North American health data.

<u>Concluded Genetically Modified Crops:</u>

- Are safe to eat
- Have the same nutrition and composition as non-modified crops
- Have no links to new allergies, cancer, celiac or other diseases.

Extensive and continued studies on GMOs are being conducted

https://nas-sites.org/ge-crops/

Thanks to many members of my research lab over the last 32 years

Thank you for your attention!