

All Transgenic Plants Are Not Created Equal

Most processed foods in the United States contain some ingredients that were obtained from genetically engineered foods.¹ However, not all genetically engineered foods are equal. To date, the majority of genetically engineered plants that have been approved for commercial use contain genetic changes that have to do with herbicide or pesticide resistance. They are classified as **agronomic** because their main purpose is to make the growing of those crops less costly (farmers save money by losing fewer plants to insect damage or by not having to buy and apply as many herbicides).

But future generations of genetically modified crops are being developed to contain pharmaceutically active proteins. A **pharmaceutically active protein** is simply a drug, such as a vaccine or medicine. Although the biology behind creating those agronomic and pharmaceutical transgenic plants is similar, the consequences of the changes may be very different. For example, the health effects on humans who consume a plant that contains a pharmaceutical transgene can potentially be quite different from the health effects on humans who consume a plant that contains an agronomic transgene.

Another issue that must be considered when using plants to make pharmaceutically active proteins is the use of food crops (such as corn, soybeans, rice) versus nonfood crops (such as tobacco).^{2,3} Food crops offer several advantages over nonfood crops when creating pharmaceutical transgenic plants, such as the ability to eat the plant directly and the fact that proteins are more stable and easier to store for long periods in food plants such as grains. However, the use of nonfood crops has the benefit of potentially limiting unwanted human exposure to the transgenes because they are not consumed directly by humans.

Endnotes:

1. K. Hopkin, "The Risks on the Table," *Scientific American*, April 2001, p. 61.
2. Michelle Marvier, "Pharmaceutical Crops Have a Mixed Outlook in California," *California Agriculture* 61, no. 2 (2007): 59-66.
3. M. Marvier and R. C. Van Acker, "Can Crop Transgenes Be Kept on a Leash?" *Frontiers in Ecology and the Environment* 3, no. 2 (2005): 99-106.

STUDENT PAGE

Rubric for Presentation

	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations	Score
Introduction (title and outline)	0 points <input type="checkbox"/> Title or outline or both do not accurately reflect contents of presentation. <input type="checkbox"/> Title or outline or both are missing.	12 points <input type="checkbox"/> Title and outline mostly reflect contents of presentation. <input type="checkbox"/> Title and outline are present.	2-4 points <input type="checkbox"/> Title and outline accurately reflect contents of presentation. <input type="checkbox"/> Title and outline are present.	
Content	0 points <input type="checkbox"/> Information provided is inaccurate. <input type="checkbox"/> Information is not explained clearly. <input type="checkbox"/> Terminology is not defined.	1-4 points <input type="checkbox"/> Information provided is mostly accurate. <input type="checkbox"/> Information provided is mostly explained. <input type="checkbox"/> Some terminology is defined.	4-8 points <input type="checkbox"/> Information provided is accurate. <input type="checkbox"/> Information presented is clearly explained. <input type="checkbox"/> All terminology is clearly defined.	
Visuals	0 points <input type="checkbox"/> Text is too small to be read. <input type="checkbox"/> Pictures and graphics are not used.	2-3 points <input type="checkbox"/> Text is mostly effective. <input type="checkbox"/> Use of pictures and graphics mostly enhance presentation.	3-5 points <input type="checkbox"/> Text is large enough to be read by entire audience. <input type="checkbox"/> Use of pictures and graphics enhances audience's understanding of the content.	
Grammar and spelling	0 points <input type="checkbox"/> There are more than two grammar and spelling errors.	1 point <input type="checkbox"/> There are fewer than two grammar and spelling errors	3 points <input type="checkbox"/> There are no grammar or spelling errors.	
Presentation style (Include a final slide that lists major contributions of each group member)	0 points <input type="checkbox"/> Contribution of all group members is unclear. <input type="checkbox"/> Diction and voice level do not engage audience.	2-3 points <input type="checkbox"/> Most members of the group contributed to presentation. <input type="checkbox"/> Diction and voice level are mostly effective at engaging audience.	3-5 points <input type="checkbox"/> Each member of the group contributed to the presentation. <input type="checkbox"/> Diction and voice level engage the audience.	
Total Score				