

Honors 177

MIDTERM

Title:

**G(r)ene House:**

**The Health Risks Associated with GMOs**

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Major: MIMG

# ABSTRACT

The creation and display of a G(r)ene House, a combined green house and laboratory, will enable participants to consume genetically modified plant products grown in the green house and later identify the location of the modified gene in their body. The intent of the project is to inform participants about the dangers of genetically modified organisms on our health by illustrating their ability to insert into our genome and interfere with normal gene processes.

# CONCEPT / TOPIC

I am interested in presenting a scientific analysis in an aesthetically appealing way: by using fluorescent in situ hybridization techniques to give the public a clear and concise picture of the effect of GM foods on human health.

Genetic modification of foods has occurred since the early 1990s, however, most GM foods have been put straight onto grocery store shelves next to their conventional counterparts without a word of warning, because the gene products added into the foods are considered generally recognized as safe (GRAS) by the FDA<sup>1</sup>. In an interview, a doctor at the FDA stated, “DNA already is present in all foods and is presumed to be GRAS. As I described before, adding an extra bit of DNA does not raise any food safety issues.”<sup>2</sup>

Unfortunately, her statement is completely false.

# CONTEXT & PRECEDENTS

According to many members of the scientific community, recombinant DNA technology is “inherently risky” when it comes to producing new foods, because normal gene processes can be disrupted by wedging foreign DNA in a random matter into an organism’s genome.<sup>3</sup>

In addition, upon consumption of GM foods, recombinant DNA does not always

fully break down, allowing gut bacteria to take up these plasmids the insertion of which can interrupt human gene functioning, cause allergic/toxic reactions, even produce the gene products like antibiotics or herbicides inside the human stomach.<sup>4</sup> Research into the effects of genetic modification is hard to come by as very little of it has been completed. In one experiment, the transgene from GM soy survived in the small intestine in 3 of 7 patients studied.<sup>5</sup>

Anti-GMO statements have been made by activist groups like saynotogmos.org and The Campaign for Healthier Eating in America. Even artists, like the Critical Art Ensemble, “genetically un-engineered” Monsanto’s GM Round-up Ready soybeans in a project called “Fuzzy Biological Sabotage.”

# PROJECT PROPOSAL



A G(r)ene House will be constructed, with GM plants grown on one side, and laboratory equipment set up on the other. The plants will be grown individually with images of the plasmids used for their genetic modification behind them. The lab equipment will include tools necessary for the fluorescent in situ hybridisation procedure (also known as FISH), and a fluorescent microscope to produce the FISH image like the one seen behind the lab setup on the right, which highlights where the GM plasmid is found in the human body after consumption.

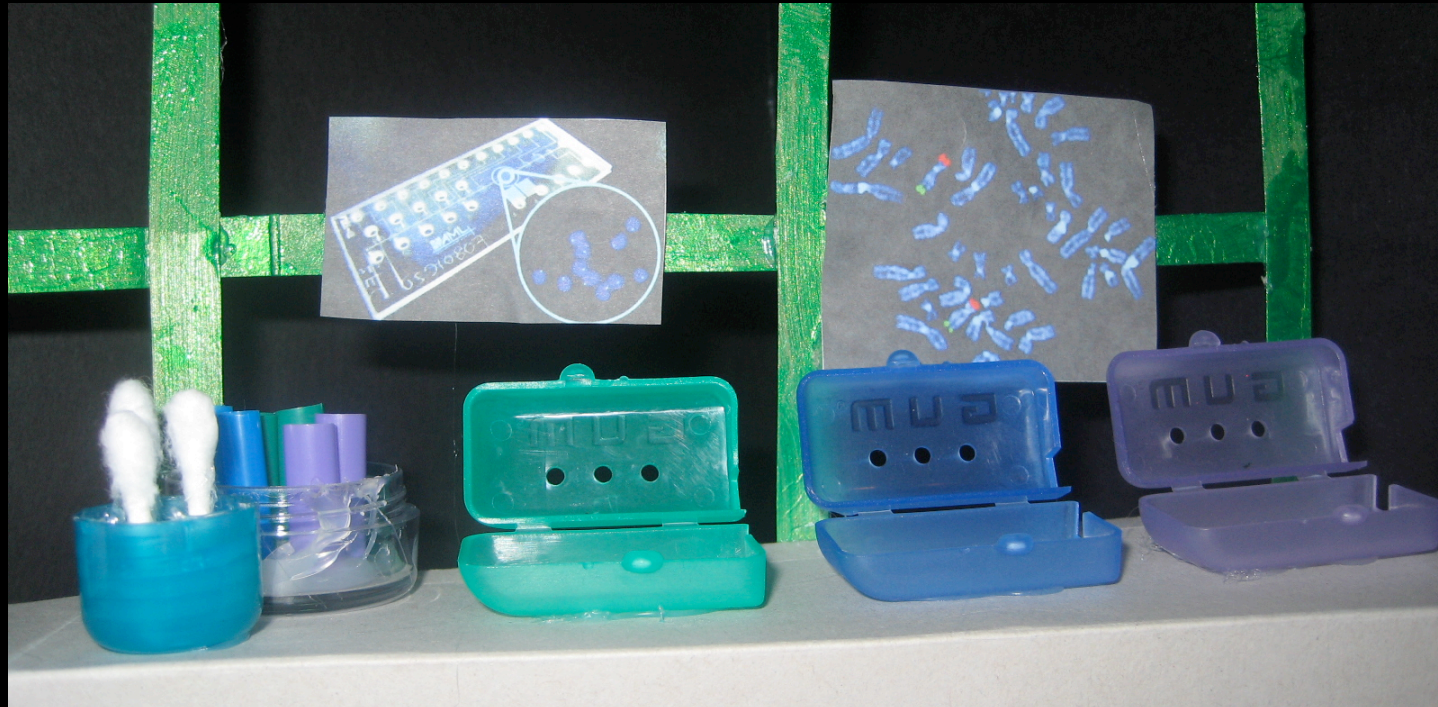
[NOTE: Mutagenized plasmids will be used so as not to confer any harmful effects on participants.]

## Project Proposal (cont.)



Upon entry into the G(r)ene House, participants will be asked to choose what GM food they would like to consume, either the Flavr Savr tomato, Bt corn, or Roundup Ready soybeans. They will then consumer the product and be given time to digest it. During that time, the concept of GM foods (what they are, how they are made, and why they are harmful) will be explained, using the plasmid images for illustration and education purposes. Of the GM food choices listed, Flavr Savr tomatoes were taken off the market due to ill-effects resulting from animal trials, Bt corn has been pinpointed as the cause of a large number of Monarch butterfly caterpillar deaths due to the high levels of toxin production, and Roundup Ready, a Monsanto product, has been contested for years due to the large amount of herbicide resistance it contains.

## Project Proposal (cont.)



After the initial digestion time, participants will be asked to pick up a cotton swab and swab the inside of their cheek for DNA, which will then be placed into one of the colored test tubes which contains a buffer material to collect the DNA. This DNA will then be used in a FISH analysis, using a relatively new version of the technology called FISH-on-a-chip, which will be carried out on a small chip inside one of the colored boxes. This process uses the plasmid DNA as a probe to identify the location of the plasmid DNA in the human genome after GM food consumption. In order to visualize the fluorescence, the hybridization must be left alone for twenty minutes (during which time the FISH procedure will be explained). The slide will then be looked at under a fluorescence microscope and a photograph taken as a print out of the location of the plant plasmid in the human genome.

# Conclusion

It's often true for most aspects of our lives that we do not believe things until we see them ourselves. Therefore, although people have been told GMOs are bad, and several countries (like Europe and Japan) refuse to grow or even sell them, Americans continue to unknowingly consume these products each and every day, with no regard for the detrimental effects they could be having on their health.

This project allows all participants to realize how unpredictable and harmful plasmid delivery is, in addition they are able to discover why they should say no to GMOs.

Seeing exactly where a plant plasmid can affect a human and in just what ways allows consumers to see what these products are doing to their bodies.

Although the details of this project are not fully plausible yet, we may be headed this direction rather soon. With the knowledge that 90% of our body is bacterial, scientists realized that knowing the human genome is not enough, and are now working to sequence our "micro-biome" (the many millions of bacteria that live on and in us). With this knowledge and a more appropriate sequencing method, internal gut bacteria can be probed for GM plasmids, which are primary targets for re-insertion.

For now, the goal of this project is to introduce the idea of genetic modification of foods to the public and inform them of the consequences, encouraging them to think twice before their next meal - because if the government is going to let these products slide right onto our shelves, it's up to us to be educated enough to avoid them.



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1,2 “Are Bioengineered Foods Safe?” Larry Thompson. FDA Consumer Magazine. Jan-Feb 2000. USDA. [http://www.fda.gov/fdac/features/2000/100\\_bio.html](http://www.fda.gov/fdac/features/2000/100_bio.html)

3 Declaration of Dr. Richard Lacey, M.D., Ph.D. United States District Court for the District of Columbia Alliance for Bio-Integrity, et al. Plaintiffs v. Donna Shalala, et al. Defendants. Civil Action No. 98-1300 (CKK). [http://www.saynotogmos.org/scientists\\_speak.htm](http://www.saynotogmos.org/scientists_speak.htm)

4 “Genetically Modified Foods: Are they a risk to human/animal health?” Arpad Pusztai. Action BioScience. <http://www.actionbioscience.org/biotech/pusztai.html>

5 Netherwood, et al. “Assesing the survival of transgenic plant DNA in the human gastrointestinal tract. Nature Biotechnology. 22, 204-209. 2004. <http://www.nature.com/nbt/journal/v22/n2/full/nbt934.html>

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