Proper Marketing of Genetically Engineered Products May Alleviate Opposition and Unfounded Fears Toward GMOs - A Survey

**Tag Words:** Beer, GMO, genetic engineering, Rutgers tomato, corn, wheat, cotton, Hawaiian Papaya, CRISPR CAS9, transgenic, Frankenfoods, hunger, microbrew, beer

**Authors:** Michael Brotherton, Rob Trachtenberg and Julie M. Fagan, Ph.D.

**Summary:** There are numerous potential benefits that can be made possible through the use of genetic engineering in agriculture including increased crop yield, insect resistance, drought resistance, and many others. Unfortunately, due to the fears of unfounded health risks and anti-corporate sentiment generated by a sensationalized media, public distrust and misinformation cause resistance and backlash against many potential benefits that this technology can bring. We seek to gain public support through focusing on other immediate benefits in genetic engineering such as better taste and higher quality food products. In order to achieve our goals we have employed two separate projects focused on swaying public opinion of genetically engineered foods. We determined whether a genetically engineered beer would be commercially viable by surveying people that regularly drink beer. We then highlighted the benefits of better tasting crops through genetic engineering by making a video that focuses on the use of a transgenic tomato with a lemon basil gene and other GM vegetables in the making of a pizza. Through these projects we hope to demonstrate novel ways to highlight and gain support for genetic engineering.

**Video Link:** https://youtu.be/q0Yvk-J6RbQ

**The Issue:** There’s the science of GMOs, then there is believing something for no good reason (MB)

This paper will not be a dispute over the benefits or harms of genetically modified foods because there isn’t an argument to be had regarding the current concerns that the public has. Not since the debate on climate change circa 2000 has there been a topic where scientific consensus and public viewpoint has differed so drastically as in the genetic modification of crops. We will look at some of the harms that come from these unfounded arguments over food safety including how scientific progress and biotech development are being stifled and if there are any other legitimate issues regarding biotechnology in agriculture and how the current debate may be inadvertently making these issues worse. We will then search for possible solutions and possible ways to sway public opinion to support a beneficial advancement in the development of bioengineered agriculture for the world. We also want to explore the new methods used in gene editing such as CRISPR CAS9, which uses a direct editing approach so that any seeds produced will no longer be developed through hybridization, will be done without the incorporation of any other species’ genes and therefore will no longer be transgenic.

**Consequences of false information and fears surrounding GE foods** (MB)

Currently there are many beneficial genetically engineered crops that have been developed in universities and small biotech companies that will probably never make it to market due to
regulations and restrictions based in fear over transgenic organisms. We are investigating alternative methods in order to dispel the fears surrounding these products with widespread potential benefits to mankind. One major opposition that people have to genetic engineering is due to the large corporations that control it, an unintended consequence of the anti-GMO movement is that the only companies that can get past the restrictions imposed by anti-GMO legislature are the large agro-giants which then just further ensures a monopoly on genetic engineering of crops.

History of the GE food debate (MB)
There are few issues in the world today that are more polarizing than the debate on the use of GM (Genetically Modified) foods. Since the first successful commercialization of a biotechnology-derived crop in the 1990s, many new crop varieties have been developed and made available to U.S. farmers and farmers worldwide. In 2012, 88 percent of the corn, 94 percent of the cotton, and 93 percent of the soybeans planted in the U.S. were varieties produced through genetic engineering (1). Proponents of biotechnology in agriculture focus on the benefits to the environment, increased crop yields, and benefits for developing nations including better nutrition and possibilities for economic gains.

Opponents of the use of biotechnology in agriculture focus on potential risks including effects on human health and possible dangers to the environment. A web search on GM foods will bring up many sites that focus on perceived potential risks and many arguments that veer towards the viewpoint that we know too little about the technology and the unknowns may come back to haunt us (2). While there are justifiable socioeconomic concerns with the ways that large capitalist companies that own the GE seed lines are gaining a stronghold in US farming, there has yet to be any evidence found that supports the health-based risk arguments, yet the fear of these products is widespread throughout our society.

To address what some perceive as the public's misperception of science, the American Association for the Advancement of Science in collaboration with Pew Research conducted two surveys in the U.S., one of AAAS scientists and one of the general public. (3). One question asked whether they "think it is generally safe or unsafe to eat genetically modified foods." Of the scientists polled, 88 percent chose "generally safe," but only 37 percent of the public said the same thing. The safety of eating GM-foods had the largest gap of any issue (2).

Unintended Consequences (MB)
Currently there are genetically modified crops grown in the US, including transgenic corn, soybeans, and cotton that have been engineered to resist insects and herbicides. Most of these products go into animal feed, biofuels, and cooking oils. Unfortunately, development of other beneficial engineered crops has faltered due to opposition creating a lack of investment in these foods. There are multiple food security concerns on the horizon including a population increase that is expected to hit 9 billion by 2050 (1) and climate change predicted to adversely affect the growing conditions in many areas. It is widely held that conventional agriculture won’t be enough to meet our demand for food produced by conventional farming techniques. Fear of genetically modified crops is becoming a more dire and relevant problem every day now. This fear has led to very few new investments going into developing new transgenic crops and many beneficial crops that have already been produced will likely never make it to market. The only
companies that can keep up with the costs of development and approval are the biotech giants like Monsanto whose interests lie in sticking with their current development of herbicide resistant and Bt producing varieties. All that the current opposition has managed to do is make it easier for the corporate giants to thrive while making it impossible for new biotech startups to develop more beneficial transgenic lines.

**Examples of Bioengineering in Agriculture (MB)**

Today there only a very short list of transgenic crops used solely for food for direct human consumption including a papaya grown in Hawaii that is resistant to a virus that nearly wiped them out of existence and a sweet corn variety produced by Monsanto. In the US the majority of GE crops are used in animal feedstock and in processed foods. Corn is the number one produced genetically modified crop in the US, followed by soybeans, and cotton; none of these examples make it directly to your plate in their original form and instead go into animal feed and are processed into syrups and oils. GE potatoes that are resistant to bruising and may produce less of the cancer causing acrylamide recently gained US approval but are not yet in the food supply (3). Zucchinis and yellow summer squash with viral resistance have been commercially available since the 1990s (3) but only a very small amount are produced. Herbicide tolerant canola accounts for 90% of the crop grown in the US. A recently approved crop is the non-browning apples which received approval in February of 2015 but have yet to appear on supermarket shelves. While there is a surplus in the processed foods and sweeteners used in many of our foodstuffs, the only true GM crop that has been available for direct consumption has been the Rainbow Papaya.

**Lack of Essential Nutrients in Soil to Grow Crops (RT)**

Crops are nitrogen dependent for production therefore areas without sufficient nitrogen in the soil will not produce a yielding crop. Crops such as corn responsible for a large portion of a culture’s caloric intake can easily be produced at a greater rate with a lower cost with a sufficient nitrogen supply. This supply of nitrogen is added to soils via fertilizers in most cases but this can be costly and bad for the surrounding environment, especially when fertilizers are chemical. Historically, farmers in areas that have low nitrogen content in their soil will combine their corn crops with legumes such as beans to benefit from the nitrogen-fixing bacteria which live in their roots. This method is tedious, more labor intensive, and does not allow for large amounts of nitrogen to integrate into crops. Integrating such bacteria directly into a crop such as corn or genetically manipulating the crop to create its own nitrogen would give it sufficient amounts of nitrogen to flourish.

One way to improve crop production is by genetically modifying the crop itself to extract the nitrogen from the air and process it using nitrogen fixing genes from bacteria and integrating them into the seeds. Another way is to incorporate these nitrogen-fixing genes into the bacteria that do live in symbiosis with the crop to increase the amount of nitrogen they omit into the soil for the roots to consume. Genetic modifications can be made to the bacteria and the crop both as well. This would require the crop to be genetically altered to make roots such as legumes do to house the bacteria and the bacteria to be genetically modified to want to live in the crop’s roots (4).

**Better Tasting and Smelling Tomatoes (RT)**
Dr. James E. Simon of Rutgers University along with associates have derived a way to genetically engineer tomatoes to make them smell and taste better. By synthesizing monoterpenes to add to the tomato genome, it provides the altered fruit with an increase of scent and taste properties. Carotenoids are also synthesized in the same manner to enhance the ripening in these genetically altered tomatoes. These genetic alterations of tomatoes are engineered in a way to affect only the taste, ripeness, and smell of the fruits. These genes that are altered have no negative effects on the consumer and in no way can harm someone when eaten (5).

**The Hawaiian Papaya: A Case Study** (MB)
The Papaya has been a global delicacy that has been grown for export in Hawaii for much of the last century. The fruit was suited to be grown and farmed on the island’s climate. Then in the 1990s, the Ringspot Virus or RSV hit the big island, showing itself in plants in 1992 and on many farms began to eliminate 80% of plants threatening the entire Hawaiian papaya industry (4). Natural immunity to the RSV doesn’t exist and any attempts to introduce it through conventional breeding methods proved ineffective. In the 1980’s, researchers at Cornell University began to develop a transgenic papaya that was resistant to the virus, and in 1998 they were approved by the FDA. In these early years, there was little controversy over GM products like the papaya, and the transgenic variety became dominant in Hawaii essentially saving the local papaya industry. Recently, debates and concerns over issues surrounding GM crops have led to these varieties being banned for import in many countries and subsequently for Hawaii implementing a GMO ban for any new transgenic crops. The climate of fear surrounding GMOs has led what should have been a success in saving the industry has just resulted in more problems and concerns. It is these public concerns that we seek to alleviate in order to help an industry with widespread potential for public benefit to thrive.

**Wheat (RT)**
Wheat production in the U.S. faces many growing challenges these days such as the climate changes and drought. Recent increase in temperatures and decreases in precipitation in the Midwest causes loss of growth and yield of one of our most viable crops. With the addition of genetic engineering, wheat farmers will be able to produce more crops and they will be allowed to survive through harvest. The National Association of Wheat Growers and U.S. Wheat Associates have shown that 75% of American wheat farmers surveyed support the use of biotechnology for seeds in commercial agriculture.

In India, the production of wheat is tedious and unsuccessful in many areas due to a variety of temperature and elevation changes. Additional fertilizers and specific growing times are needed in order to grow wheat in India’s six separated zones of climate. Genetic objectives to improve wheat include making it suitable to various stressors such as drought, varying temperatures or growing season lengths, resistance to leaf/stem rusts or leaf blight, and the ability to grow high quality durum for export.
<table>
<thead>
<tr>
<th>Country</th>
<th>Crops</th>
<th>Area (hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Maize Soybean Cotton Canola Sugar Beet Alfalfa Papaya Squash</td>
<td>73,100,000</td>
</tr>
<tr>
<td>Brazil</td>
<td>Maize Soybean Cotton</td>
<td>42,200,000</td>
</tr>
<tr>
<td>Argentina</td>
<td>Maize Soybean Cotton</td>
<td>24,300,000</td>
</tr>
<tr>
<td>India</td>
<td>Cotton</td>
<td>11,600,000</td>
</tr>
<tr>
<td>Canada</td>
<td>Maize Soybean Canola Sugar Beet</td>
<td>11,600,000</td>
</tr>
<tr>
<td>China</td>
<td>Cotton Papaya Poplar Tomato Sweet Pepper</td>
<td>3,900,000</td>
</tr>
<tr>
<td>Paraguay</td>
<td>Maize Soybean Cotton</td>
<td>3,900,000</td>
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<tr>
<td>Pakistan</td>
<td>Cotton</td>
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<td>South Africa</td>
<td>Maize Soybean Cotton</td>
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<td>Uruguay</td>
<td>Maize Soybean</td>
<td>1,600,000</td>
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<tr>
<td>Bolivia</td>
<td>Soybean</td>
<td>1,000,000</td>
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<tr>
<td>Philippines</td>
<td>Maize</td>
<td>800,000</td>
</tr>
</tbody>
</table>

Figure 1. Genetically modified crops grown around the world today

**Negative Spin on GMOs (RT)**
People fear that genetically altering our food may have undesired effects on the consumer. The big debate is that people with little or no genetic knowledge and experience do not fully understand what is actually being done when genes are being genetically engineered. A term such as “mutation” or “genetically modified” to the untrained ear makes people fear that when eaten. Food may transfer genetic changes like an infection acquires a new host.

**Current and Future Techniques (MB)**
There are typically five steps that are used to create a transgenic crop. Step one is to isolate all DNA from the desirable gene that you want to insert into the crop. The next step is to find the specific sequence that codes for the desirable protein that you want to express and to amplify it. You would then take that specific sequence and modify it so that it will be compatible with the plant you want the gene to be expressed in. Step 4 is to transform the plant with the gene that codes for the protein you want expressed (insect protection, oil production, etc.). In the final step you would cross breed the plant with optimal performers in the field to produce the optimal plant with the gene you want expressed (1).
This specific method of bringing a gene from one species and introducing it into another is what makes something transgenic and a GMO. Other methods can be used to get exactly the same genetic makeup, this technique is the most precise but also the most controversial.

There are other methods that produce genetic mutations in crops that are widely used and are not considered a GMO and in fact contain many crops praised by organic food advocates including the ruby red grapefruit. This specific method is called mutation breeding (6). A specific mutagen is used on an entire seed line and then they are then grown and observed for beneficial traits. These traits are then bred in with conventional techniques to produce a crop with the beneficial trait. Many biotechnologists are now using transgenics as a template for a beneficial trait and then using mutagenesis to acquire the same genetic attribute. This is a lengthy and costly process but is still cheaper and faster than getting through the regulations placed on transgenics and GMOs.

The future is promising for genetic engineering in agriculture with new technologies being used such as CRISPR CAS9, where a gene can simply be edited to develop whatever trait is being sought without developing a transgenic organism. With this technology there will foreseeably be much less restrictions needed to pass a crop into commercial production and should alleviate any concerns associated with markers such as antibiotic resistance genes.

What we feel like we need is a new outlook on genetic engineering in agriculture and in order to do this we need to change the viewpoint of the American public. In order to accomplish this we need to look towards the future.

Genetic Engineering of crops can increase yields, develop varieties that are resistant to insects and disease, and produce drought resistant and varieties tolerant to high salt and mineral concentrations; all of which can help to increase food production worldwide in a way that could help to feed the world’s population which is expected to reach 9 billion by 2050.

**Community Action: Changing the Negative Image of GE Crops Through Marketing**

(MB) Our end goal of our community action plan is to envision developing a better tasting microbrew that is not only developed through genetic engineering but proudly exclaims how it is a genetically engineered product on the label.

Some of the ways we can create a better tasting beer is by chopping out the gene that creates the butter-flavored molecule diacetyl that tastes bad in beer, or turning up the expression of genes behind alcohol tolerance other beneficial flavors. We feel the technology is readily available to develop our product and genetic engineering can easily improve on the taste of other beers on the market today.

(RT) To shed scientific light on the aspect of the fact that genetically engineered or modified foods are as harmless as their natural altered counterparts, we will use marketing strategies to promote a product. By promoting specific genetically altered products we can also include aspects of the fact that they are harmless and economical to the everyday consumer. To show truth in a marketing aspect, the view of genetically engineered consumer goods will include
taste, health, economic benefits, and the positive effect on the issue of world hunger. We highlighted the benefits of better tasting crops through genetic engineering by making a video that focuses on the use of a transgenic tomato with a lemon basil gene and other GM vegetables in the making of a pizza (video link: https://youtu.be/q0Yvk-J6RbQ). Through these projects we hope to demonstrate novel ways to highlight and gain support for genetic engineering.

We have also developed a survey to acquire public opinion on our topics and products alike. By using this survey as a case study, it will provide us with a template for the reaction of the public to genetically engineered consumption goods as well as the term, “GMO” itself.

The Survey:

Male or female?
- Male
- Female

What is your favorite beer?

Age?
- under 20
- 20-29
- 30-39
- 40-49
- 50-59
- 60+

How often you drink beer?
- Never
- Only Special Occasions
- Weekly
- Daily

How important to you is taste when you choose a beer?
- Very important
- I like what I like
- I drink the cheapest thing that will get me drunk
- Somewhat important

Would you drink a great tasting beer if it was made from yeast that had been genetically engineered?
- Yes
- No
- Maybe

I'd consider drinking a beer made from genetically engineered yeast if: Select all that apply
- I knew there were no safety concerns
- it tasted great
- it came in a really cool bottle
- it cost less or the same as a comparative beer
☐ Don't know. I don't understand what "genetically engineered" means
☐ Nope

**Would you consume beer labeled as a GMO?**

☐ yes
☐ maybe; depends on taste and cost
☐ no, I'll only consume non-GMO beer

**GMO stands for:**

☐ Generally Modified Objects
☐ Genetically Manufactured Organism
☐ Genetically Modified Organism
☐ God Move Over
☐ Oh My God
☐ I don't know
☐ Generally Manipulated Organism

**Survey Results (RT)**
The survey was administered online for all Rutgers University affiliates. To gather survey respondents, we used social media devices with a Google platform. The student researcher posted in Rutgers specific social media pages a link to the Rutgers University CAS system which logs them into the survey webpage on google forms.

Overall we gathered 63 responses giving us varying data from a wide range of consumers. The male to female ratio was almost identical showing no bias to gender although there was a large student base leaning towards a more educated response as well as ages in which mostly ranged in the twenties. More than 50% of our responses claimed to drink beer weekly and that taste was very important when they did.
Response to GMO’s: Over 50% also claimed that they would drink a great tasting beer if it were made with genetically engineered yeast. This shows that those that drink beer regularly would not necessarily be brand-dependent enough to refuse to try a new beer. There were only nine responses (at 14.3%) that said they would not drink great tasting beer that was genetically engineered. So even those who claimed to be more brand dependent and “like what they like” would be willing to try genetically engineered beer and possibly switch to it as their beer of choice. The majority of survey takers also had no problem with beers that were to be labelled GMO and many of them knew what GMO stood for. There could possibly be a correlation between those who said they did not know what GMO stood for or chose the wrong option as to what it does stand for and those who would refuse to drink a beer labelled as a GMO. About 75% of those participating in the survey knew what GMO stood for and almost 90% said they either would definitely or possibly consume a beer made with GMO ingredients depending on taste and cost. These results lean towards the fact that the majority of people who are educated on the fact that GMOs are harmless to your health are willing to consume genetically engineered products while the ones that have a lack of knowledge of the subject of genetics may just be afraid of something they do not quite understand.
Implications for the Future (MB)
What we take from this report is that our plan of helping to further the public view of genetic engineered foods by developing and labeling a better tasting beer that is genetically engineered is a feasible option. We are further optimistic that the age demographic that is currently attending bars and drinking specialty beers showed potential for wanting such a product. These results are promising in the fact that there may be alternative ways to gain support for genetic engineering. Using a product like this as a platform for more information on further benefits for genetic engineering and humanity has the potential to be successful according to our results. Labels on the beer bottles, news articles and reports, and generating interest through buzz are possible ways we can impact the public view through a specifically marketed genetically engineered beer.

References


Letters To The Editor

Please consider publishing this letter as it regards an issue that is relevant, polarizing, and has the potential to have a major impact on how we feed an ever increasing global population and work towards new ways to combat global warming.

How unfounded fear over the safety of gmo foods has backfired with unintended consequences

You don’t have to dig deep to see how widespread the fear over gmos (genetically modified organisms) or ge (genetically engineered) foods has become. Any internet search will bring up hundreds of blogs and websites dedicated to the possible associated risks. Another major argument we see repeatedly focuses on the corporate control that large agro-businesses have over the farming industry.

Unfortunately all that the fear mongering over the safety of gmos ends up doing is ensuring the stronghold that companies such as Monsanto have on the industry by ensuring that no new biotech startup players will enter the field and that the only companies that will develop new GE products will be the companies that have the existing capital to conform to costs and regulations.

Finally we see that in this climate of fear and concern the GE products that are affected the worst are the ones with the greatest potential benefit to humanity. Ten years ago a group of nonprofit foundations funded genetically engineered rice that was enhanced to produce B-Carotene,
deficiency of which can lead to blindness. To this day the governments of India, Bangladesh, and elsewhere have still not approved this “Golden Rice” for release. UC Berkeley agricultural economist David Zilberman and colleagues calculated that if development and commercialization of Golden Rice had been allowed in 2002, by now we would have saved at least one million people from blindness and prevented the death of thousands of children. (Zilberman 2014).

With many other benefits that GMOs can bring to mankind, opponents need to consider the damage that the fear can be doing both to their own interests and to humanity as a whole.

Sincerely,

Michael P. Brotherton
New Brunswick, NJ 08901

Letter to the Editor (RT)

Robert Trachtenberg

Editor of Natural News
http://www.naturalnews.com/050454_GMO_research_biotech_dangers_health_issues.html

Dear Editor,

I am contacting you to provide you with the knowledge that a recent article entitled, “GMOs Are Dangerous to Our Health, According to the Latest Independent Research” on your website appears to be inaccurate and provides no scientific data of its own. The author, Joel Edwards, seems to describe GMOs in a very bad light and expresses his disgust using no actual research as a basis for his arguments. Mr. Edwards does provide examples to support his argument and provides resources from which he got his information however, the sources he claims to base his arguments on are not scholarly articles or journals, but just opinionated articles from other unaccredited sources.

Genetic modification is simply using the ability of artificially selecting which genes to include in an organisms genome. Technically this has been done since the beginning of crop production and farming in a form of selective breeding but is now with modern technology, able to be done at a rapid pace to select exactly the genes that are wanted without the hiccups of natural breeding. For your author to say that genetic modification is unsafe without any explanation of how it is any different than getting extremely lucky when crossbreeding is ignorant and says that Mr. Joel Edwards has very little to no research experience in the field of genetics.

The author makes multiple arguments derived from other articles’ arguments saying that GMOs are dangerous and support for them is a corporate scam without any actual research based sources. One opinion was based on the argument that herbicides are harmful to people in large
doses which does not have anything to do with the crops themselves but the fact that large amounts of herbicides are used on crops whether we alter their genes or not. Another claim made in the article is that known spokespeople such as Neil deGrasse Tyson and Bill Nye are paid off by corporations such as Monsanto to promote the science behind GMOs with no actual evidence of this at all.

My solution to this problem is to have a retraction of this article and have it rewritten using viable sources and possibly by an author that has some prior knowledge of the subject.

Sincerely,
Robert Trachtenberg

http://cropwatch.unl.edu/biotechnology/makinggmo

Appendix 1: Human Subjects Research Protocol

Human Subjects Research Protocol IRB#E16-339

I. Are Human Research Subjects Likely to Drink a Beer Labeled GMO?

II. Objectives
To study the current views regarding the consumption of products made with GMOs in regards to safety and taste.

III. Background and Rationale
There are many internet articles that highlight and spread fear surrounding the health risks associated with Genetically Engineered or GMO foods. This fear has led to an overwhelming support for the labeling of foods that are made with or contain GMOs and a general feeling for avoiding these food products in general. We seek to learn whether an alternative product such as beer that highlights another advantage of genetic engineering such as taste will lead people to be willing to try a product that is labeled as GMO. We will sample beer drinking college age students from Rutgers University to determine their likelihood of consuming a beer labeled as a GMO.

IV. Procedures

A. Research Design
We will be conducting a survey on our target market which will be people who are current consumers of beer. The survey will be a stratified random sample and will be administered online for Rutgers affiliates. The student researcher posted in Rutgers specific social media pages a link to the Rutgers University CAS system which logs them into the survey webpage on google forms.

B. Sample
Subjects will be current consumers of beer and must be 18 years of age or older

C. Measurement / Instrumentation.
The variables of interest are whether or not the subject would consume a GMO labeled beer.

D. Study Site(s)/Location of Procedures:
The survey will be administered online for all Rutgers University affiliates.

E. Detailed study procedures
Subject evaluations and duration of subject participation in the project will continue through November 25, 2016. Surveys will be answered anonymously. Electronically distributed surveys with answers from the research subjects will only be viewed by the student researcher. Collected subject data will be protected by password protected folders on the student researcher's personal computers. The personal information will be stored until the end of the study on November 25, 2016.

F. Consent Procedures:
Consent: The study will be explained to the subject by the student principal investigator once the subject responds with interest to a post on a Rutgers social media page. Participants will be offered the informational sheet below

The student researcher will say: “This research study is being conducted as part of a class project at Rutgers University which has been approved by the Human Subjects Institutional Review Board under protocol IRB#E16-339. The study involves only a survey to be filled out that is both anonymous and confidential. Your participation in this study is strictly voluntary. The student researcher has been approved by the Rutgers Institutional Review Board to conduct the research. The consent will be read, and your questions answered. By giving verbal consent, you will be agreeing to participate in the study that you are over the age of 18.”

G. Internal Validity
Results of the surveys will be quantitatively analyzed by counting the number of subjects who are willing to consume a beer labeled as GMO compared to those who wouldn’t. Personal responses will be recorded and analyzed in comparative charts for each response generated.

H. Data Analysis
The data collected by the electronically distributed survey will be tallied in a spreadsheet for each question. Spreadsheet responses will then be analyzed in pie charts for easy visualization of data.

V. Bibliography

Informational Sheet

Title: The Denial of Science: Opposing GMOs
Authors: Julie M. Fagan, Ph.D. with students Michael Brotherton and Rob Trachtenberg

INTRODUCTION: You are invited to voluntarily participate in a research study that will measure the willingness to consume a genetically modified beverage.

BENEFITS: You will not receive any direct benefit for participating in this research. However, it is expected that the research will provide scientists with a better understanding of consumer fears over certain GMO products.

RISKS: This study consists of only a survey and there are no risks involved.

CONFIDENTIALITY: This research is completely anonymous. No information will be recorded that could identify you.

COMPENSATION: You will receive no monetary compensation for participating in this study.

RESEARCH QUESTIONS: If you have any questions regarding the study, you may contact Dr. Julie Fagan at 848-932-8354 or email her at Fagan@rutgers.edu

SUBJECT RIGHTS: If you have any questions about your rights as a research subject, you may contact the IRB Administrator at Rutgers University at: Institutional Review Board, Rutgers University, the State University of New Jersey, Liberty Plaza / Suite 3200, 335 George Street, 3rd Floor, New Brunswick, NJ 08901, Phone: 732.235.9806, Email: humansubjects@orsp.rutgers.edu

The Survey:
Male or female?

- Male
- Female

What is your favorite beer?

Age?

- under 20
- 20-29
- 30-39
- 40-49
- 50-59
- 60+

How often you drink beer?

- Never
- Only Special Occasions
- Weekly
- Daily

How important to you is taste when you choose a beer?

- Very important
- I like what I like
- I drink the cheapest thing that will get me drunk
- Somewhat important

Would you drink a great tasting beer if it was made from yeast that had been genetically engineered?

- Yes
- No
- Maybe

I'd consider drinking a beer made from genetically engineered yeast if: Select all that apply

- I knew there were no safety concerns
- it tasted great
- it came in a really cool bottle
- it cost less or the same as a comparative beer
- Don't know. I don't understand what "genetically engineered" means
- Nope

Would you consume beer labeled as a GMO?
☐ yes  
☐ maybe; depends on taste and cost  
☐ no, I'll only consume non-GMO beer

**GMO stands for:** question should appear if they answer no to the above question

☐ Generally Modified Objects  
☐ Genetically Manufactured Organism  
☐ Genetically Modified Organism  
☐ God Move Over  
☐ Oh My God  
☐ I don't know  
☐ Generally Manipulated Organism

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**CONSENT FORM**

**FOR ANONYMOUS DATA COLLECTION**

You are invited to participate in a research study that is being conducted by Dr. Julie Fagan who is an Associate Professor at Rutgers University. The purpose of this research is to determine participant’s likelihood of consuming a GMO beer.

This research is anonymous. Anonymous means that I will record no information about you that could identify you. There will be no linkage between your identity and your response in the research. This means that I will not record your name, address, phone number, date of birth, etc. If you agree to take part in the study, you will be assigned a random code number that will be used on each test and the questionnaire. Your name will appear only on a list of subjects, and will not be linked to the code number that is assigned to you. There will be no way to link your responses back to you. Therefore, data collection is anonymous.

The research team and the Institutional Review Board at Rutgers University are the only parties (please modify if others will have access to the data) that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for three years.

There are no foreseeable risks to participation in this study. In addition, you may receive no direct benefit from taking part in this study. Participation in this study is voluntary. You may choose not to participate, and you may withdraw at any time during the study procedures without any penalty to you. In addition, you may choose not to answer any questions with which you are not comfortable.

If you have any questions about the study or study procedures, you may contact myself at Michael Brotherton, xxx New Brunswick, NJ. You can also contact my faculty advisor Julie M. Fagan, Ph.D. at 84 Lipman Dr., New Brunswick, NJ 08903, fagan@scarletmail.rutgers.edu.
If you have any questions about your rights as a research subject, please contact an IRB Administrator at the Rutgers University, Arts and Sciences IRB:
Institutional Review Board
Rutgers University, The State University of New Jersey
Liberty Plaza / Suite 3200, 335 George Street, 3rd Floor, New Brunswick, NJ 08901
Phone: 732-235-9806, Email: humansubjects@orsp.rutgers.edu

Please retain a copy of this form for your records. By participating in the above stated procedures, then you agree to participation in this study.

If you are 18 years of age or older, understand the statements above, and will consent to participate in the study, click on the "I Agree" button to begin the survey/experiment. If not, please click on the “I Do Not Agree” button which you will exit this program.

I Agree  I Do Not Agree