

*Design of a Genetically Modified Food Database***Introduction:**

The goal of IPRO 318 for its first semester was to create a new source of information about GM products and to provide information to answer the many questions about this important subject.

Background:

Genetically modified crops are produced from organisms that have had their DNA altered through genetic engineering. These plants have been modified in the laboratory to enhance desired traits such as increased resistance to herbicides or improved nutritional content. They have been available since the 1990s and the most common GM organisms are soybean, corn, canola, cotton seed oil and wheat.

These genetically modified crops are made by taking DNA from one organism, modifying it in the laboratory and then inserting it into the target organism's genome. In this case the target would be the crop of interest. This new DNA would help produce new and useful traits or phenotypes. These types of genetically modified crops are known as transgenics. Other methods that exist include increasing or decreasing the number of copies of a gene already present in the crop, silencing or removing a particular gene or modifying the position of a gene in the genome of the crop. This type of genetic engineering is different from plant breeding because the process is faster and more accurate.

According to the FDA and the United States Department of Agriculture (USDA), there are over 40 plant varieties that have completed all of the federal requirements for commercialization. Examples of these types of crops include tomatoes and cantaloupes that have modified ripening characteristics, soybeans that are resistant to herbicides, and corn and cotton plants with increased resistance to insect pests. Not all of these genetically modified crops are available in supermarkets but the prevalence of them is higher than is commonly thought. Even though there are very few genetically modified whole fruits and vegetables available, there are many highly processed foods that contain some small percentage of genetically modified ingredients. This is due to the fact that the raw ingredients have been brought together into one processing stream from many different sources. The widespread usage of soybean derivatives as food additives in American diet shows that U.S. consumers have been already exposed to genetically modified foods.

In 2006, 97% of the global transgenic crops were manufactured in the United States (53%), Argentina (17%), Brazil (11%), Canada (6%), India (4%), China (3%), Paraguay (2%) and South Africa (1%). It is believed that the numbers will plateau in industrialized countries but developing countries continue to grow GM crops in an exponential manner. Other countries that grow GM crops include: Australia, Bulgaria, France, Germany, Mexico, Romania, Spain, and Uruguay.

Between 1995 and 2005, the total surface area of land cultivated with GMOs had increased by a factor of 50, from 17,000 km² (4.2 million acres) to 900,000 km² (222 million acres). The United States used 55% of this total acreage to cultivate GMO's.

Purpose:

Genetically modified crops have come to play an increasingly large role in our daily lives. Unfortunately these crops remain a mystery to much of the general population. For some, ideas about GM crops are exciting and represent hope for new potential in science and agriculture, they represent potential danger, and there are simply many unanswered questions.

Our goal this semester was to create a new source of information about GM products and to provide information that answers the many questions we all have about this important subject. To accomplish this, our objectives were to:

1. Collect background information in an unbiased and comprehensive manner about laws and regulations regarding genetically modified crops.
2. Present facts about the processes and technologies that are used in this industry.
3. Collect information in relation to peanut allergens.
 - a) The group has decided to begin researching allergens specific of peanuts. It was decided that researching the peanut specifically was most beneficial to subsequent IPROs. The future goal of this project was to genetically modify peanuts and hopefully create an allergen free nut.
4. Create a database of known genetically modified crops, potential allergens, and traits in order to provide future IPRO's with a foundation of knowledge concerning GM crops.
5. To organize this information into a user friendly webpage

Research Methodology:

- A. Current web pages are not easily understood by many members of the general community. Many of these pages are saturated with information. A person who does not have a strong scientific background may not understand what is being explained. Many sites do not include the basics of genetically modified crops. Consumers may not be aware of the possible advantages and disadvantages of the modifications.
- B. The goal was to create a cache of information about genetically modified crops. This information includes laws and regulations, background, and technology. This information was used to create a web page that is user friendly for the general public. This targets those without a strong scientific background who may be interested in what exactly modified crops are. The web site includes the history of genetically modified crops, the technology used to modify the crops, the advantages and disadvantages of modifying crops, and a list of crops that have been modified. The site will provide simple and easy to understand material. The site is easy to navigate, making it user friendly. The site also provides links to more extensive information if the user would like expand their research.

In order to create this site, the team divided into sub-teams. The first team was responsible for the background of GM crops, laws regarding genetically modified foods in the US, and the disadvantages and advantages of GM crops. This group was also responsible for creating the web page. The second group was responsible for creating a database of all known genetically modified crops. They also were responsible for researching why these crops were modified and what technologies were used.

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To help ensure each aspect was researched the class was divided into sub-teams. Each sub-team had a sub-team leader and each member of the team had an individual task.

The class as a whole met each Tuesday and Thursday from 3:15pm-4:30pm. These weekly meetings were used to present each sub-team's research and goals. The time was used to discuss and evaluate the progress each team made.

The sub-teams met as needed. Each member was responsible for an individual task within the sub-team.

The team met with a representative from the National Center for Food Safety and Technology to gain more knowledge about food allergens.

Assignment:

Team Member	Educational Background	Year	Skills/Strengths	Team Role(s)	Sub-team	Individual Tasks within subteams
Jennifer Miller	Biology	4th	Background in Microbiology and Genetics	Team leader	Database / Technology/ Peanut	Researching wheat, researching technology, weekly task creator, help create abstract
Nivedita Chandrasekharan	Biochemistry	2nd	Research and laboratory assistant, background in Biology and Genetics	Sub-team leader	Web page / Background/ Laws and Regulations	Compiling and editing of information, research on laws, poster group
Ali Khiabani	Molecular Biochemistry and Biophysics	2nd	Computer, Scientific research study	Team Member	Web page / Background/ Laws and Regulations	Research on the benefits, organizing project management outline, I Groups organizer, poster group
Andres De la hoz	BME	4th		Team Member	Web page / Background/ Laws and regulations	Risks, research on laws and regulations, abstract

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						group
Elizabeth Kuebrich	Biochemistry	3rd	Academic Interest: Forensics and Genetics	Team Member	Database / Technology/ Peanut	Researching corn, Code of Ethics, technology research, work on abstract
Lauren McClelland	Biochemistry	3rd	Academic interest: Biochemistry, Genetics, and microbiology	Sub-team minute taker	Database / Technology/ Peanut	Researching cotton, project management, peanut allergen research, poster group
Pavan Patel	Biochemistry / pre-medicine	4th	Computer skills, background in genetics and human biology	Team Member	Web page / Background/ Laws and regulations	Background, laws and regulations research, updating website, poster group
Jennifer Peavler	Chemical Engineering	4th	Proficient in laboratory techniques such as electrophoresis and separation techniques. research pertaining to biotechnology	Sub-team leader	Database / Technology/ Peanut	Researching tomatoes, researching soybean, abstract group
Hee Seo	Applied Mathematics	4th	Mathematical Skill, Data researching and analysis	Sub-team time keeper	Database / Technology/ Peanut	Researching rice, Code of Ethics, research on peanut allergens, abstract group
Kurt Ziegel	Architecture	5th	Architecture, Graphic Design, Industrial Design	Team Member	Web page / Background/ Laws and Regulations	Compiling and editing of information, project plan editor, research on laws and

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						regulations, poster group
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Obstacles:

1. There is too much information available on the subject of genetically modified crops to gather and organize. The solution the team came up with was to break up into two sub-teams.
 - a) The database sub-team created a collective list of genetically modified crops. From this list, the top six crops in the United States were chosen and researched more in depth. To divide the bounty of information, a number of specific topics were researched for these crops. The information researched included country of origin, background, technologies, major companies, and predominant countries.
 - b) The background sub-team researched the background of genetically modified crops. This is to include the risks and benefits associated with genetically modified foods.
2. Much of the available information on-line is biased. It is very difficult to obtain information that can be presented impartially. Many sites focus solely on the negative aspect of modified crops. Other will only portray the positive aspects. Rarely do you find a site which only states the facts.
 - a) To prevent this from occurring, the team acquired a majority of their research from recognizable sites such as the FDA. The team also retrieved much of their information from credible journals. Statistics and other facts were checked against other sources.
3. Lack of computer experience among team members made the creation of the website difficult.
 - a) The team invested in a guide to website creation and spent considerable time and effort to familiarize themselves with the method of creating a webpage.
 - i. The site is now operational. The site is easy to navigate and is being used to display the research the team has conducted.

Results:

The team has completed a number of the projected results identified earlier in the project. There is no deviation from the expected results at this point in time.

1. The team has collected background information on genetically modified crops, including the history of genetically modified crops, benefits, and risks.
2. The team has collected information on corn, tomatoes, rice, wheat, and cotton including country of origin, background, technologies, major companies involved, and predominant countries doing research on them now.
 - a) These crops were chosen because they are the most predominant genetically modified crops in the United States.
3. The team collected information on the eight peanut allergens
4. The website has been created and uploaded onto the web. (www.iit.edu/~ipro318s08)

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- a) The website displays information collected by the team through out the semester.

Recommendation:

- Research Protein Engineering
- Research Current Peanut Modifications
- Maintain Relationship with National Center for Food Safety and Technology

Acknowledgements:

The team of IPRO 318 would like to extend our appreciation to the National Center for Food Safety and Technology and to anyone else who helped our group throughout the semester.

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