IPRO 318

Food Safety, Genetically-Modified Crops and Protein

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Peanut Allergens:
Ara h1 to h8

Food allergens can be grouped into major and minor allergens. Major allergens are proteins that can interact with specific IgE (Immunoglobulin E) of more than 50% of the allergic patients studied. Generally, many major food allergens belong to major food proteins. This suggests that a high dose of a particular food protein increases the chance of inducing an allergic reaction. This observation can be applied to peanut allergy since **2 major peanut allergens, Ara h1 and Ara h2,** are also major peanut proteins and comprise 12% to 16% and 5.9% to 9.3% of total peanut protein content, respectively. Both major peanut allergens have a highly stable nature and more than 95% of peanut allergic individuals had specific IgE to Ara h1 or Ara h2. **Other peanut allergens (Ara h3 to h8) are considered as minor allergens** due to their lower sensitizing rate in peanut allergic individuals. Eight different peanut allergens have been identified, cloned, and expressed.

Future of the IPRO

Establish a database of known allergens. Utilize the information collected this semester to look into the isolation of specific proteins which causes allergens in peanuts and tree nuts.

Special thanks to:

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.

For more information please visit our website:
www.iit.edu/~ipro318s08

List of Crops

Alfalfa	Plum
Argentine canola	Polish Canola
Barley	Potato
Carnation	Rice
Chicory	Soybean
Cotton	Squash
Creeping Bentgrass	Sugar beet
Flax, Linseed	Sunflower
Lentil	Tobacco
Maize	Tomato
Melon	Wheat
Papaya	

List of Countries

Argentina	Netherlands
Australia	Paraguay
Brazil	Philippines
Canada	Poland
Columbia	Portugal
China	Romania
Czech Republic	Russia
European Union	Spain
France	South Africa
Honduras	Switzerland
India	Taiwan
Japan	United Kingdom
Korea	United States

Technologies

- **Vectors**

inserting the gene for yellow skin colour, from capsicum).

bacteria transfers new gene into host plant

Plants with new characteristics are generated

"carrier" bacteria

building new gene by joining DNA from different organisms

- **Injection**
- **Gene Splicing**
- **Biolistics (Gene Gun)**

gene gun barrel

plastic disc with DNA-/coated gold particles

disc stopped by screen

target plant cells

DNA-coated gold particles

http://artsci.wustl.edu/~anthro/blurb/Backgrounder.html

- **Protoplast transformation**
- **Electroporation**
- **Calcium Phosphate precipitation**
- **Gene silencing**
- **Viral Vector**
- **Lipofection**

Fusion

Nucleus

Cell membrane

Cytoplasm

Endosome

Lysosome

Liposome-cell membrane interaction

Endocytosis

Liposome-DNA complex

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Risks

- Creates farmer dependency on GM food companies and patent prevents the use of these benefits without considerable payment.
- Can have unforeseen health side effects as a result of genetic variation.
- Reduces biodiversity, making crops more susceptible to epidemic.

Benefits

- Allow for the development of crops that require less pesticide use, which helps the environment.
- Strong, resistant crops are less prone to damage.
- Shelf life of food can be greatly increased.
- Food with higher quality nutrients can be used to treat nutrition issues.

What is Genetically Modified (GM food?

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.

Background of GM food

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.
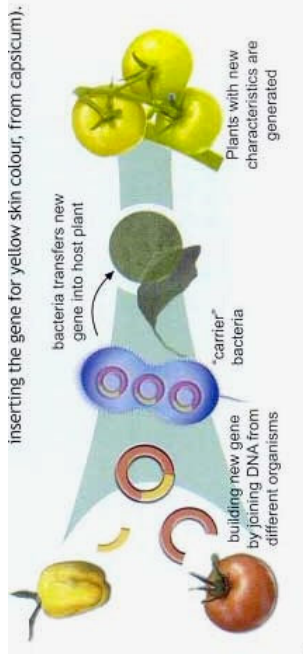
Objective of IPRO 318

Our goal this semester was to create a new source of information about GM products and to provide information that will answer the many questions.

Information collected towards achieving the short term goals of this IPRO will used in the development of future IPROs that will be focused on protein engineering to reduce the severity of known allergens in peanuts and tree nuts.
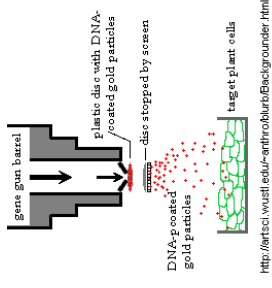
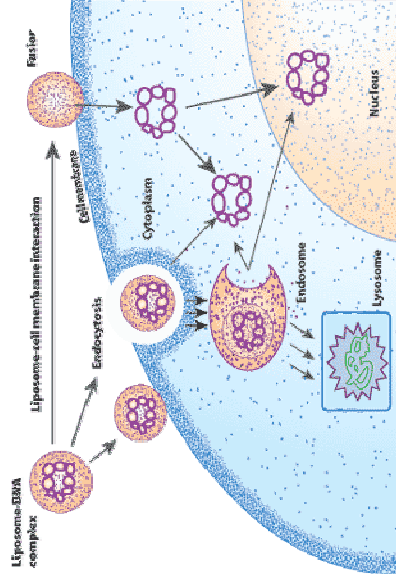Currently, GM food is a serious debate between the European Union and the United States. The European Union's legal standards for GM food are much higher and more thorough than the United States, and the overall perception of GM food among the population is not entirely approving. The United States, on the other hand, is more comfortable with the issue. This is further hindering the progress of GM food, for good or bad.