1 Background, Current situation, Reason

Good afternoon, Professors and everyone. We are group 1, I am Martin and they're my groupmate, Wales and Ka. Today, we are here to discuss the topic of are genetically modified foods safe for human consumption? Our presentation consists of an overview for GM foods, GM production, safety of GM food consumption and some related regulation.

First of all, in this diagram, which is genetically modified? Potatoes, corn, apples, bean, all of them are the example of GM food nowadays. And start with the definition, according to World Health Organization, foods produced from or using genetically modified organisms are GM foods or in other words, when DNA is changed unaturally by recombinant DNA technology or genetic engineering, it can be identified as GM food.

And GM food is talking a food with 5% or more materials, and the items are GM or not depends on these 5 standards.

Lets take a look to the current situation of GM foos, in fact 94% of soybeans are GMO and 96% cotton , 99.9% sugars beets are GMO. Here comes to more GM foods example. From salmon, to papaya, even rice.

There are many reasons for GM foods development. From climate resilience, more tolerance to the climate change to withstand the environmental issues, to increase the nutrition, like fortify golden rice, which is a common example. Last but not leat, biotic stress resistance, for instance insect resistance we will use Bt crop an.

And here is the benefits, it make food more nutrients, easy to grow and better foods access.

2 Production of GM

And how GM food make. It is linked to the DNA recombination, which we learnt from this course or in our high school biology. It contains 4 steps, step 1 identify the target gene, and step 2 copy the ligated product of desired gene and vector, and step 3 insert the ligated product to organism and cultivated the transformed palnt.

Here comes to another method, call gene gun to shot the recombination DNA to the cell directly, instead of infection. And now, lemme pass the time to Ka to talk about safety.

3 Is it safe?

Circling back to our focus question. Is GM food safe?

To answer this question, we want to address the common public concerns about GM foods,

which are the possibility of allergic or toxic reactions,

the GM having unexpected or even harmful genetic changes,

and finally a risk of cancer in the long term.

3.1 Allergic & Toxic

First, let's look at the possibility of allergic or toxic reactions.

In the year 2000, there was an allergy scare regarding a strain of GM corn called Starlink. 28 cases were reported to be possibly related to Bt protein hypersensitivity. However, blood tests showed that there was no correlation between the corn and the symptoms of the 28 people.

Similarly, in other cases, no direct evidence can be found saying that GM food can cause food allergies if the person isn't originally allergic to that food.

In fact, GM can be instrumental in fighting food allergies like peanut allergy, milk protein allergy, and gluten sensitivity, by removing the allergens in the foods.

In the case of peanut allergy, the major allergens are Ara h 1, 2, 3, and 6, which are legume seed-storage proteins. When they enter the body, they can trigger an immune response, leading to vasodilation and airway constriction. But GM can stop the peanuts from expressing these proteins to avoid triggering immune responses.

Of course, we must also test the GM foods to ensure their safety. And there are relatively easy methods to test if GM increased the potency of allergens.

- First, if the subject's allergy is unknown, we can do RadioAllergoSorbent Tests (RAST) where we collect the blood serum from the subject and expose it to the food. We can test for allergic reactions by seeing if the IgE antibodies bind to the food allergens.

- But if we already know the subject's allergy beforehand, we can do the second test which is ImmunoBlotting where we gel electrophorese the food allergens before using an antibody specific to the allergen of interest to test for its presence.

- Third, we can also do Peptin Digestion tests where we subject the food proteins to a pepsin solution that mimics stomach acid. Smaller particle sizes after digestion indicate a smaller chance of allergic reactions.

3.2 Unexpected genetic change

The second concern is that there will be some unexpected genetic changes after GM.

One example is GM rice. To increase the protein content, soybean glycinin gene is added. While the protein concentration did increase; further testing revealed that it is actually due to a decrease in water content without affecting the protein content of the rice.

Another example is GM soybean. To make the plants herbicide resistant, an agrobacterium gene is added. However, it also produced a side effect of increasing genistein & trypsin inhibitor content in the soybean, which can cause health problems when eaten.

These examples perfectly illustrate why GM foods need to undergo testing before they can be sold in order to make them safe for consumption. We will talk more about this later.

3.3 Cancer risk

The third concern is the risk of cancer when the GM foods are eaten for a long time.

Researchers compared global cancer rates to America's cancer rates and concluded that there is no correlation between GM foods and cancer rates as the cancer rates of America, which the

first country to sell GM foods to citizens in a large scale, did not have a sharp rise compared to other countries.

4 What makes it safe?

So what makes these GM foods safe? The CODEX alimentarius, aka the CODEX, it is a collection of international standards, guidelines and codes of practice to protect the health of consumers and ensure fair practices in the food trade

afety Assessment of GM food considers:

Characteristics of the donor and host organisms

Composition

Dietary intake

Nutritional data

Toxicological data

Allergenic properties

To date, all GM foods put in the international market following these assessments are proven to be fit for human consumption

5 Ethic concern & Conclusion

6 Extra information