

Consumer Perception and Safety Issues of genetically modified Foods in Korea

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Abstract

Most Korean consumers do not understand or know much about genetically modified (GM) food and transgenic technology. They seem to be intimidated by the topic and express a cautious attitude toward GM food and its technology. The situation has been further aggravated by propaganda distributed by activists and other opposing groups. Therefore it is said that the general public has an “abstract concern” regarding GM food. Awareness of GM foods is fairly high (>65%), but the acceptance level is very low (<13%) among Korean consumers. Only a little over one-third of the Korean public knows that every living organism has its own genes or DNA. The mass media have had a great influence on consumer perceptions and acceptance of GM food. The media tends to deal with GM ingredients in a negative manner. Safety issues related to GM food raised by Korean consumers are no different from those raised by consumers of any other country. The issues are the allergenic potential of newly introduced protein, antibiotic-resistant genes, deleterious effects of long-term consumption (especially by the younger generation), and hazardous effects unforeseen by current-day technologies. Other additional allegations made by activists are inappropriateness of the concept of substantial equivalence, of safety evaluation procedures (reviewing safety materials generated by developers, but not testing by government), and of exemption of labeling requirements for certain processed foods, including soy sauce and cooking oils.

Media summary

A review of the awareness, understanding and attitude of Korea consumers on GM foods, and the safety issues concerning GM food consumption.

Key Words

Genetically modified foods, safety, awareness, perception, attitude

Introduction

The world's population is expected to grow to about 9.5 billion by 2050, compared to the current population of about 6.5 billion in 2007. (U.S. Census Bureau, 2008). Therefore there will be about 3 billion more people to feed on earth within about 40 years from now. However, the land for crop and livestock production will continue to decline with the further growth of cities. It is thus inevitable that agriculture with higher productivity will be necessary to ensure adequate food supplies for the ever-growing number of people on earth. GM crops are a very effective alternative for intensive agriculture, achieving better productivity with less pesticides and herbicides.

The introduction of GM crops is advantageous to the environment because non-specific insecticides are replaced by specific Bt crops which provide beneficial changes in the diversity of insects and other living creatures. Reductions in chemical herbicides and insecticide use will reduce contamination of agricultural products and water bodies. Reduction in pest damage of

crops will benefit farmers. Consumers also benefit through the modification of nutritional entities like vitamins, essential amino acids and fatty acids.

Despite apparent benefits and advantages, there have been concerns voiced regarding food safety issues over the introduction of foreign genes into plants which will eventually be used as human food. The objective of this paper is to review the food safety issues concerning the dietary exposure of humans to GM foods.

Understanding and Attitudes of Korean Consumers

Awareness and Understanding

- Most respondents were aware of agricultural biotechnology. Their main source of information was the news media.
- The majority of respondents were unfamiliar with basic genetics.
- GM foods can help to increase yields and contribute to alleviation of food shortages.
- Most Korean consumers accept negative messages from media reports about GM food
- Korean consumers have only intermediate faith in GM food developers for safe food.
- Some of the respondents believe that herbicide tolerant crops contain herbicide.

Attitudes

- Almost all Korean consumers wanted foods with GM ingredients labeled as such.
- The majority of Korean consumers have not yet decided about purchasing GM foods in preference to conventional foods. They will not buy GM foods for the time being until more is known.
- Korean consumers do not have confidence in the government and in food processors in Korea. NGO groups and food experts are most, and almost equally, trusted concerning the verification of food safety.
- Only a fraction of respondents regarded GM ingredients as a hazardous factor. Residual agricultural chemicals like pesticides and food additives are regarded as the most hazardous factors in foods sold in Korea.
- Many Korean consumers have not formed any opinions about GM foods. More Korean consumers would choose GM foods with consumer benefits (e.g. vitamin-rich) over those with agronomical benefits (e.g. herbicide tolerant), if they are available. As long as GM food is beneficial to humans, more Korean consumers would be ready to accept it. More Korean consumers would choose vitamin-rich GM soybeans than herbicide resistant ones.
- For consumers, the information of most interest on the label was the expiration date.

We do not have GM-labeled national products on the market, because domestic food processors do not use GM ingredients for the products with labeling requirements. However, GM commodities are used for cooking oil and fermented sauces which are exempt from labeling requirements.

Food safety issues

Particular food safety issues are the possibility of allergenicity of the resultant proteins derived from introduced genes, of deleterious effects of long-term consumption especially by the younger generation, and of hazardous effects unrealized by current technology. Other issues are antibiotic-resistant genes and ethical issues.

The latter two issues are raised mostly by people who are negative toward GM foods without prior education on biology. These questions raised by the general public are the ones for which experts

in GM technology do not have good explanations available yet. Experts should make more efforts to develop logical arguments to explain such hard-to-explain issues.

It is logical for consumers to worry about the possible hazardous effects of new proteins; allergenic potential and chemical toxicity of new protein(s). The GM soybean with introduced Brazil nut 2S protein project was perceived differently by the two parties: proponents and opponents of GM foods. GM proponents say that the safety check system works fine and there is nothing to worry about. GM opponents, however, say that this is evidence that a foreign protein can cause allergic reactions. Both parties are right on this matter, and developers are doing their best to sieve out the allergenic potentiality from the start to the end of their projects because they are aware of the possibility. It is time for the other party to appreciate that developers do their best to ensure their products are allergy-free. Another safety issue of new protein(s) is the chemical toxicity of the protein itself. The toxicity of the new protein is assessed using an animal feeding test.

Concerning the antibiotic-resistant genes, some experts suggest that feeding GM plants containing antibiotic-resistant marker genes could transfer the gene to microorganisms in the intestines of animals or human beings. This problem originated from the unusual case that intact antibiotic-resistant genes can be transferred from one bacterium to another. A scenario is that antibiotic-resistant genes from GM foods/feeds are taken up by gut bacteria in animals and humans during digestion. If bacteria carrying antibiotic resistance genes were ever to cause infections, it would be difficult to treat. However, there is no evidence that the antibiotic-resistant genes in GM foods pose a threat. It is agreed that antibiotic-resistant genes should not be used as a precautionary measure. In fact, antibiotic-resistant genes are not used these days and other techniques are used to select recombinants, including using auxotrophic mutants. Resistant genes for the antibiotics, kanamycin and ampicillin, the commonly used marker genes, are known to be already widespread in microorganisms that cause diseases. They are very prevalent in our natural food items, including fruits and vegetables, doing no harm to us. Therefore even if resistant genes from GMOs were transferred to bacteria in a few cases, the rise in the number of antibiotic-resistant bacteria in our environment would be immeasurably small.

Other issues include the arguments over the appropriateness of using substantial equivalence (SE) concept in assessing the safety of GM foods, and of simply evaluating (reviewing) the safety materials generated by developers. SE, a strategy adopted to assess safety of GMOs, is based on the comparison of the GMO with their non-GM counterparts. The underlying assumption of this comparative assessment approach for GMOs is that traditionally cultivated crops have gained a history of safe use. Crop characteristics (morphology and yield) and food composition (proximate analysis, key nutrients, key anti-nutrients, and animal feeding) are compared (OECD, 1993). Some EU scientists denounce the introduction of the SE concept as being influenced by politics and commercialism (Millstone et al., 1999). They maintain that toxicological and biochemical tests can provide information vital to consumer protection. Concerning SE, they think that compositional analysis as a screening method for unintended effects has its limitations, in particular regarding unknown anti-nutrients and natural toxins. Advanced techniques such as DNA analysis, protein fingerprinting, secondary-metabolite profiling and in vitro toxicity testing have been suggested to test for differences between GM and its non-GM counterpart.

NGOs opposing GM foods are not satisfied by the safety assessment process of reviewing safety materials submitted by the developers. They maintain that the government should verify the safety of GM foods. This, however, does not make sense because the safety of all other products is supposed to be assessed by the manufacturers. Additionally, NGOs in Korea keep pressing the government that the exemption of labeling requirement for cooking oils and soy sauce should be nullified and that tolerance levels for the adventitious presence of GM in non-GM crops should be

lowered from the current 3% to 0.9% as in the case of the EU.

Conclusion

On the whole, Korean citizens perceive that GM foods have considerable potential benefits, including the alleviation of food shortages. However, they are not prepared to accept foods prepared with GM ingredients, because of health concerns about GM foods. The food safety issues include potential allergenicity of novel proteins, antibiotic resistance genes, deleterious effect of long-term consumption, hazardous effects unrealized by current technology. It is very important to stress that debates over the safety of GM foods should be based on sound science. Some scientists do not like to share the idea of using the principle of substantial equivalence (SE) for the assessment of food safety evaluation. In the future, food safety assessments of GM foods should make use of various new profiling techniques to satisfy more people, including those who do not agree with SE. All GM foods imported into and distributed in Korea have been thoroughly evaluated by the relevant government authorities and are considered safe for human consumption. GM foods are not approved until they are considered safe. Lastly, improving public perceptions of the safety of GM foods is considered to be a challenge that deserves a higher priority than further development of new GM varieties.

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