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Reconsidering the Toxicology of GM Food

D. Kouretas

Department of Biochemistry-Biotechnology University of Thessaly, Volos, Greece

If we go a few years back, we can see what WHO /as saying in terms of the first regulatory action on ıe problem of GM food: "Considerations that should e made on the biosafety of GM food are practically ıe same with natural food" (substantially equiva-ıncy dogma). This is a misleading and erroneous tance to take, because technically speaking, pro-uction of animals or plants by taking advantage of iotechnology has no resemblance to the production y traditional breeding methods.

Organization of genetic material in plants or ani-ıals is extremely complicated. Every time that na-ıre tries to create new varieties it preserves the atural hierarchy of the genome. In GM organisms ıat are used in GM food, the genetic modification mploys artificial units of DNA that are introduced in nimal or plant cells, which always disrupt the natu-ıl organization of the host genome. The conse-uences of this phenomenon known as position ffect have been well described (Palmitter and Brin-:er: *Ann. Rev. Genet. 20*: 645-660, 1986). This ffect has been taken as minor problem by the sci-ıtists which were first experimented with GM food, ut someone can assume that considering the ıowledge at that time, this misleading stance was ıken in purpose.

Once exogenous DNA is injected into reproductive ells of the organism, the introduced gene is ran-ɔmly incorporated into the host genome, resulting disruption of the order of the host genome. ıerefore the genetic modification in an organism, actically results in a loss, of the balanced func-ɔning that is preserved through traditional breed-g.

As a result, a new plant or animal is produced, that able to synthesize proteins or substances that are ɔt made or made in a different quantity by the par-ıt organism. These proteins can be allergenic or xic as shown in the literature. The same is also ıe with the other substances of the GM foods. The tter is well pronounced in the example of the nutri-ɔnal tragedy in USA in 1989, when many people ed from the eosinophilia-myalgia syndrome. One company that was making tryptophan from genetically engineered bacteria, changed the manufacturing conditions during the process. The result was a by-product of the fermentation that was finally consumed by many people , and created the problem. The absence of testing of GM foods at that time has been changed over the years, but in a way that does not exclude the risk to the consumer.

Another example has been published by Reddy and Thomas (*Nature Biotechnology 14*: 639-642, 1996). During their effort to create GM tobacco to produce gamma-linoleic acid, the GM tobacco produced also a highly toxic fatty acid that was not expected. There are other numerous examples that describe the production of substances in GM food that were not expected and all these events can be explained by the position effect phenomenon.

We see a problem arising from all above. The problem of incomplete testing of GM food. Since almost all GM organisms as explained earlier may pose risks to contain new products that are not known if are toxic to the consumers, all food that is produced by GM organisms must be tested pre-clinically and clinically with human volunteers in trials similar to what used to assess drugs and pharmaceuticals before marketing (a product with no toxicity in animals does not exclude the possibility being toxic to humans, remember thalidomide). Today the tests that are made by biotech companies are incomplete and require few weeks and are made in cell lines and mice for a period that does not make them biosafe. The tests should include processed food that has been derived from GM organisms (oil from soya) or food that contains ingredients from GM organisms (like enzymes from GM yeast used in the fermentation of cheese). This is a time consuming process but is mandatory to happen in order to minimize health hazards to the consumers.

As the genetic modification in the production of GM food may pose unexpected health risks for us and our children, new directives should be made to exclude acute or chronic toxicity, if we want the tragedy of tryptophan in 1989 not to happen again.