Modern biotechnology in food: Modern biotechnology and food safety

06 September 2006

Biotechnology has the potential to make further improvements to Europes food supply. Recent advances in food biotechnology include new processing technology and control systems, better farming systems for growing and harvesting food, genetic improvement of food crops, and new techniques for monitoring food safety and nutritional quality.

At all stages throughout the food chain from farm to fork, food safety is always an absolute priority. Guidelines designed to ensure the safety of biotechnology in food production have been developed by independent, international bodies such as the Organisation for Economic Co-operation and Development (OECD), and the United Nations World Health Organisation (WHO) and Food and Agriculture Organisation (FAO). Regulatory bodies and the companies which produce food also have in place a wide range of mechanisms to ensure food safety.

Food safety is based on the concept that the consumer will not be harmed when the food is stored, prepared and eaten as intended. Historically, foods prepared and used over many years have been shown to be safe from long-term experience, and food has generally been presumed to be safe unless a significant hazard has been identified.

Modern biotechnology - which broadens the range of genetic changes that can be made to agricultural produce and extends the scope of possible food sources - does not inherently lead to foods which are less safe than those developed by conventional techniques. There is therefore no need to make any fundamental change in assessing the safety of foods produced using biotechnology, nor to use a different standard of safety.

The food safety assessment method developed by independent bodies such as the OECD, WHO and FAO is based on comparing the new food with existing, conventional food products made using traditional techniques. It also takes into account the processing which the food undergoes and consumer exposure (the amount of the food in the diet, the pattern of consumption and the age and other characteristics of the people who will typically eat it).

The situation is simplest where a food produced using biotechnology is very similar - or "substantially equivalent" - to a traditional food. To assess whether a new food is substantially equivalent to a conventional food, three main factors are taken into account:

- What are the composition and characteristics of the traditional product?
- Which characteristics were altered to produce the new food product, and how do these change its composition? This is checked by looking at the characteristics of the unaltered, traditional product; the method used to achieve the alterations in the new food; any possible secondary effects of the alteration; and the characteristics of the altered part of the new food.
- How do the characteristics and composition of the new food compare with those of the

conventional food?

Based on these three factors, knowledge that a new food or food component was derived from materials whose newly-introduced traits are well-characterised, plus a reasonable certainty that it will cause no harm to consumers compared with its conventional counterpart, mean that a new food can be considered to be "substantially equivalent" to an existing food.

It can then be assumed that further safety or nutritional concerns will be insignificant, and the food can be treated in the same way as its conventional counterparts. An example would be an altered potato, a crop which is a traditional part of the European diet. Potatoes naturally contain viral coat proteins due to infections. These proteins have never been linked to adverse effects, and are not considered to be a food safety issue. Potatoes can be made resistant to viral diseases by introducing certain components of viral particles into the plant. A potato which had been genetically altered to contain a coat protein of one of the naturally occurring viruses at similar or lower levels to those already found in potatoes would therefore be classed as substantially equivalent to currently used potatoes. In this case, the modified food would be compared with the traditional food using appropriate, traditionally used tests, such as the measurement of alkaloid levels in potatoes.

If the new food is dissimilar to established products or has no conventional counterpart, the situation becomes more complex. Such foods are evaluated taking into account experience with similar materials, if possible, or on the basis of their own composition and properties. Differences from conventional foods or new characteristics are then the focus of further safety investigations to ensure that only food which is safe for consumption reaches the market.

The use of modern biotechnology to transfer genes between plant species raises the possibility that substances which trigger allergic reactions may be transferred from one crop to another. In the case of crops known to cause allergic reactions, special care is taken to ensure that genes coding for allergens are not transferred to other species. However, if a specific need arises for genes for known allergens to be moved between crops, appropriate information must be provided to alert hypersensitive consumers. When modern biotechnology is used to engineer proteins with a novel structure, allergy-related questions are carefully considered as part of the safety assessment.

"Modern biotechnology broadens the scope of the genetic changes that can be made in food organisms, and broadens the scope of possible sources of foods. This does not inherently lead to foods that are less safe than those developed by conventional techniques" - OECD, 1993 (in its publication on Safety evaluation of foods derived by modern biotechnology - concepts and principles).

"The use of the newer biotechnological techniques does not result in food which is less safe than that produced by conventional ones" - World Health Organisation, 1991 (in Strategies for assessing the safety of foods produced by biotechnology, the report of a joint FAO/WHO consultation)