Genetically modified animals: questions and answers

As Chinese researchers reveal they have created genetically modified cows that produce "humanised" milk, we answer some of the key questions in the GM food debate.

What is a genetically modified animal?

Animals that have had genes artificially added or removed from their DNA are described as genetically modified.

How were the genes inserted into the cow genome?

Artificial DNA, also known as recombinant DNA, was used to make genes with the codes for human milk proteins. These was were then integrated into a specially designed virus that was able to insert the artificial DNA into the genome contained within cells from dairy cows. The new genetic material was transferred into a cow egg using a process called Somatic Cell Nuclear Transfer – the process used to clone Dolly the Sheep.
Why create genetically modified cows?


Scientists believe that it is possible to enhance the cattle in some way. In the case of the Chinese research they wanted to make cows’ milk more nutritious by giving it the antimicrobial and immune boosting components found in human breast milk. Generally genetic modifications to foods are claimed to bring benefits such as disease resistance, increased yield, drought resistance or greater nutritional value.

Could genetically modified animals pose a risk to the environment?

There are concerns that artificial genes in GM plants could pose a risk to the environment if they were to pollinate other plants in the wild or other non-GM crops. If this were to happen it would mean the artificial genes from the GM plant would spread uncontrollably in wild plants and give them whatever properties the gene conveys. In the case of genes causing crops to produce pesticides or give them resistance to herbicides, it could damage insect populations or allow weeds to grow uncontrollably. As most crops that use GM technology are quite different from plants in the wild, the risk of this transfer of genes is relatively low as it relies upon the ability of the GM plants crossing with wild plants and producing viable offspring that would survive. There is a theoretical risk that non-GM crops of the same species could become contaminated though. In livestock, the risk of artificial genes escaping from the GM population is even lower. The majority of livestock breeding is now done using artificial insemination and is carefully managed. Livestock animals have also been selectively bred for thousands of years by humans and so are unable to interbreed with wild species.

Are there any risks to human health?

GM foods are assessed on a case-by-case basis by the European Food Safety Authority and other international food safety organisations. There are three main issues that are debated as potential risks to human health. The first is the risk of the genetically modified food provoking an allergic reaction when eaten. Some proteins can trigger allergic reactions in people who are sensitive to them and if genes that encode these allergenic proteins are added to a food, it can trigger reactions. The transfer of genes from the GM...
food to human cells or bacteria in the human gut is also a theoretical concern. The probability of this happening is considered to be low by the World Health Organisation. There is also a small risk that incorrectly inserted genes could produce toxins were expressed in a food stuff, this could also be harmful, but in most cases this would probably kill the GM animal in the first place. Such incorrectly inserted genes would also be picked up in the process that screens the cells before they are inserted into an egg. Such food products would also never pass through food safety assessments.

**Can it provide any benefits?**

Scientists say GM technology could bring benefits. By creating cattle or other livestock that are resistant to disease, it could help to reduce the use of veterinary drugs in the farming industry. Disease resistance could also help to prevent devastating outbreaks that can threaten a country's entire farming industry, like foot and mouth and bluetongue. Researchers in Cambridge have been working on chickens that are resistant to bird flu (http://www.telegraph.co.uk/science/science-news/8258432/Chickens-genetically-modified-to-stop-bird-flu.html). Scientists have also been attempting to produce animals and crops with greater ability to cope in drought conditions, a trait they say could be essential as the climate warms. Introducing added nutrients and vitamins to food products is also seen as being hugely beneficial in developing countries where access to the varied diet enjoyed in the Western world is harder to achieve. There is also the hope it can increase the yield of foods by making animals produce more meat and milk, or allowing crops to produce more food per acre.

**Will products from GM animals be sold in the UK?**

It depends on two factors - the regulatory authorities, and the customers. Genetically modified crops and livestock are subject to control under European regulation. Safety assessments on all GM foods are carried out by the European Food Safety Authority before they can be marketed and sold in Europe. These assessments include detailed studies of the potential for toxic, nutritional and allergenic effects. The UK's Food Standard Agency also carries out its own assessments through its independent scientific Advisory Committee on Novel Foods and Processes. More significantly, consumer opposition to GM foods has meant that food producers and supermarkets have adopted a cautious approach to using GM products. Without appreciable consumer demand, there will be little desire among supermarkets to stock such products.

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