



## GM Research: A gut feeling

The world's first GM food trial on humans served up some worrying results.

DNA is naturally present in almost all the food we eat. Your average Sunday roast will have cow DNA (from your roast beef) plus plenty of DNA from bacteria and viruses that infected the animal and plants before they even reached your plate.

We have always eaten DNA but we do not know how our gut, or our gut bacteria, will cope with genetically modified DNA (GM DNA).

Under pressure from its advisers, the Food Standards Agency (FSA) commissioned the world's first known trial of GM food on humans to find out.

### Horizontal gene transfer

The FSA wanted to discover whether 'horizontal gene transfer' occurs. Gene transfer is when the inserted transgene escapes from the modified organism into other organisms. These organisms could then take up the characteristics of the transgene.

Could this happen in the human body? Many bacteria are adept at swapping genes and taking up new ones. The concern is that our human gut bacteria could pick up GM traits, for instance from antibiotic resistance genes sometimes used in genetic engineering. Our bacteria could then become resistant to the very antibiotics that we rely on to treat diseases.

We are still ignorant about what else happens to GM DNA as it moves through our gut. Can it pass through our intestinal walls and be taken up by other cells in our body?

### One GM meal

In the FSA's study, conducted at Newcastle University, volunteers were fed one meal comprising a veggieburger made from GM soya mix and a GM soya milkshake.

The scientists searched in the faeces of the 19 volunteers for traces of the GM DNA. Seven of the volunteers had previously had ileostomies: the lower bowel is removed and replaced by a colostomy bag, enabling the scientists to examine the faeces at different stages. The remaining 12 had intact digestive systems.

### When is GM digested?

The researchers found GM DNA in all of the volunteers with a colostomy bag. They did not find any GM DNA in the faeces of volunteers with a complete gut. This part of the study was widely publicised by the FSA which announced that the research "showed in real-life conditions with human volunteers, no GM material survived the passage through the entire human digestive tract."

### Gene transfer proved

The second part of the study examined the issue of horizontal gene transfer. Taking bacteria from the faeces in the seven colostomy bags, the scientists grew them up in laboratory conditions. In three of the seven samples, the gut bacteria had taken up the inserted transgenes in the GM soya. This indicates that horizontal gene transfer occurs in the small intestine. Inexplicably, this key finding was dismissed by the FSA as "insignificant."

### Not studied

Can GM DNA move through the intestinal wall into other parts of our body? We already know from studies on mice that gene-sized pieces of DNA can penetrate the intestinal cells and move to other organs. But we don't know from this study if GM DNA moves similarly in humans, because none of the volunteers had their blood or any other body tissues monitored.

## Downplayed

After being reviewed by independent scientists, the study was published on the FSA website but not in a peer-reviewed journal. The FSA downplayed the second part of the study which found that horizontal gene transfer had occurred. The FSA concluded that "the likelihood of functioning DNA being taken up by bacteria in the human or animal gut is extremely low."

This statement seems highly misleading considering that the DNA uptake by the gut bacteria was found in the three volunteers with a colostomy bag after only one GM meal. "Do not be distracted by the colostomy bag issue," warns Gundula Azeez, the Soil Association's policy manager. "The colostomy bag just gives us a window into what is happening in the gut. This study indicates that gene transfer is probably happening to all of us every time we eat a GM meal."

## More studies needed

Dr Michael Antoniou also questions the FSA's dismissive conclusions. Senior lecturer in molecular genetics at King's College Medical School, London, he says, "to my knowledge they have demonstrated clearly that you can get GM plant material in the gut bacteria ... They have shown this can happen at very low levels after just one meal. The major individual health problem is not 'what comes out at the other end' but what goes on inside the gut. So the risk of a health problem arising from the transfer of GM genes, such as antibiotic resistance and BT toxin, to gut bacteria, still stands."

Dr Antoniou calls for follow-up work involving a large group of people over a prolonged period eating more than 50 per cent GM in their diet. "One GM meal can hardly be called statistically significant," he says, "yet it showed up these very worrying findings - all of which had been hotly denied."

How can I support the work of the Soil Association?

The Soil Association is a membership charity, we urgently need your support to continue our work. As public support for the Soil Association continues to grow, our ability to influence the thinking and policies of government and big business grows with it. In this way we help to develop a truly healthy and sustainable future. Join us today and help us to continue campaigning for sustainable agriculture and organic food. You can join the Soil Association on our website, over the phone or by writing to us.

**The above piece is from *Living Earth*, the Soil Association's award-winning membership magazine. Soil Association members get *Living Earth* free - join us today to get *Living Earth* plus many other exclusive membership benefits.**

See the whole study at [www.soilassociation.org/gm](http://www.soilassociation.org/gm). (click on 'technical information')

## Glossary

**DNA:** Contains the genetic instructions for making a living thing (organism).

**Gene:** A section of DNA that codes for a single instruction, for example, how to make eyes blue.

**Transgene:** A gene that is artificially inserted into another organism's DNA.

**Genetic modification (GM):** Genetic modification is a process that attempts to transfer a desired characteristic from one living thing to another. This is done by inserting a foreign gene into a plant or animal, in an essentially random way. It's nothing like traditional breeding methods because it involves crossing species barriers and creating organisms that would never exist in nature.

## Further Reading

Please see the Soil Association website library, <http://www.soilassociation.org/library>, for more information

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