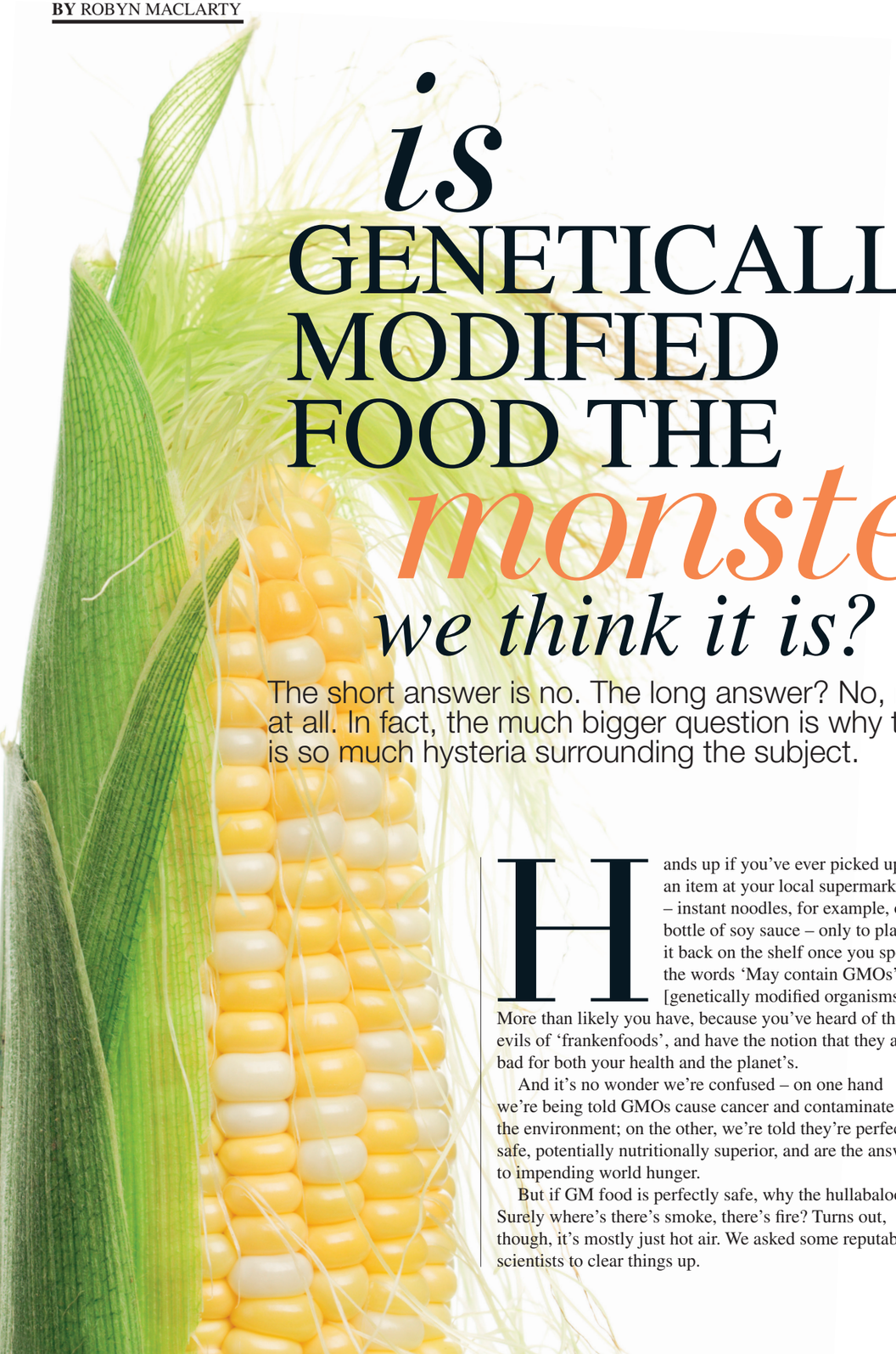
BY ROBYN MACLARTY



is GENETICALLY MODIFIED FOOD THE *monster we think it is?*

The short answer is no. The long answer? No, not at all. In fact, the much bigger question is why there is so much hysteria surrounding the subject.

Hands up if you've ever picked up an item at your local supermarket – instant noodles, for example, or a bottle of soy sauce – only to place it back on the shelf once you spot the words 'May contain GMOs' [genetically modified organisms]? More than likely you have, because you've heard of the evils of 'frankenfoods', and have the notion that they are bad for both your health and the planet's.

And it's no wonder we're confused – on one hand we're being told GMOs cause cancer and contaminate the environment; on the other, we're told they're perfectly safe, potentially nutritionally superior, and are the answer to impending world hunger.

But if GM food is perfectly safe, why the hullabaloo? Surely where's there's smoke, there's fire? Turns out, though, it's mostly just hot air. We asked some reputable scientists to clear things up.

Q WHAT EXACTLY *IS* GENETIC ENGINEERING?

Genetic manipulation of crops and animals has been used for centuries, for example by cross-breeding particular strains of plants over several breeding-cycles to reduce negative traits and build on positive ones. The difference is that now, in a lab, scientists are able to manipulate and move specific genetic material from one organism to another, which allows for a more precise approach to plant breeding than ever before. Plants produced this way are called 'transgenic', and the process is referred to as genetic modification (also genetic manipulation or engineering).

According to the World Health Organisation (WHO), GM foods are developed – and marketed – because there is some perceived advantage either to the producer or consumer of these foods. This is meant to translate into a product with a lower price, greater benefit (in terms of durability or nutritional value) or both. For example, the GMO Golden Rice was developed by the International Rice Research Institute in the Philippines to provide food insecure people in South East Asia with 60% of their RDA of vitamin A.

Q THE MILLION DOLLAR QUESTION: is genetically modified food harmful to your health?

Nope. 'No other food, in the history of humankind, has ever been as well-tested for food safety,' says lauded microbiologist Jennifer Thomson, Emeritus Professor of Microbiology at the University of Cape Town and author of *Food for Africa*. 'There is absolutely no evidence that genetically modified crops are unsafe for human consumption.'

WE ASKED YOU:

Do you think genetically modified foods are bad for your health?

yes	67%
no	11%
don't know	20%

SOURCE: FACEBOOK

Q THEN WHY IS THE SCIENTIFIC COMMUNITY SO DIVIDED OVER WHETHER GMOS ARE GOOD OR BAD?

It isn't. In fact, the National Academy of Sciences, the WHO and the US Food and Drug Administration – along with pretty much every single major scientific and biotechnology regulatory oversight body in the world – have deduced that GMOs pose no harm to human health.

'Genetically engineered (GE) crops are some of the most intensively tested food we've got,' says Dr Leon van Eck from the Department of Genetics at Stellenbosch University, and winner of the 2013 Young Science Communicators Competition. 'The public perception is that there is raging controversy in scientific circles on the safety and utility of GE crops, with researchers arguing at the lab bench and in the field, and scientists locked in furious debate with one another at scientific conferences. However, this is simply not true. There is overwhelming scientific consensus on this issue, as there is on climate change, evolution, and the benefits of vaccination.'

He says that those who claim there is insufficient research on this topic are simply wrong. 'Many hundreds of peer-reviewed scientific papers have been published on many aspects relating to the safety of GM crops. The non-profit GENERA (Genetic Engineering Risk Atlas) project curates the most extensive and complete database of these. The overwhelming majority all come to the same conclusion: the risks to human health from consuming food made from GE crops are no different than those from consuming their conventional, non-GE equivalents.'

Q BUT ANTI-GMO ACTIVISTS CLAIM TO HAVE SCIENCE ON THEIR SIDE…

'From time to time, scientists will claim to have evidence of some potential health threat from GMOs,' says Professor Thomson, 'and every single time, when that evidence is looked into by serious, professional scientists, it is shown to be incorrect.'

One of the most famous (and famously discredited) studies touted by anti-GMO lobbyists is a 2012 study by French scientist Gilles-Éric Séralini, who found that over a period of two years, rats fed with GM maize resistant to the controversial Monsanto pesticide, Round-Up, developed cancerous tumours. This

study has been thoroughly criticised as unscientific. Apart from a number of other issues, the particular breed of rat that Séralini used only has a lifespan of about two years and is prone to developing tumours. It was therefore completely unsuitable for the study.

Dr Van Eck cautions against 'junk science', which is rife, particularly on the internet, and particularly with regard to GMOs. 'Figuring out whether those claims are made with authority and are based on sound science can be tricky. Just because something uses a lot of jargon and sounds "sciencey" doesn't necessarily mean it is proper science.'

(Here's a hint: if it hasn't been peer reviewed and/or published in a reputable scientific journal, it's probably junk science.)

Q WHY ARE ANTI-GMO ACTIVISTS SO ADAMANT THAT IT'S EVIL?

This is somewhat of a mystery. 'There is so much superstition surrounding GM food,' says Professor Thomson. 'A couple of weeks ago I heard a so-called expert from the anti-GMO lobby on SAfm saying that it was her "personal belief" that the epidemic of diabetes and obesity in South Africa was caused by eating GMOs, which is simply ridiculous.'

Earlier this year, UK journalist and environmental activist Mark Lynas – historically one of the most outspoken opponents of GMOs (and who participated in vandalising field trials of genetically engineered crops) – changed his tune in a speech given at a farming conference in the UK, and has since publicly endorsed genetically modified crops. 'In 2008, I was still penning screeds in the *Guardian* attacking the science of GM,' he said, 'even though I had done no academic research on the topic, and had a pretty limited personal understanding. I don't think I'd ever read a peer-reviewed paper on biotechnology or plant science.' He went on to call the anti-GMO movement a 'conspiracy theory'. 'In the final assessment,' he says, 'the only way that conspiracy theories die is because more and more people begin to wake up to reality and reject them. Then perhaps there comes a tipping point where what was once received wisdom becomes increasingly understood for the foolish nonsense that it always was.'

'There is no necessary good or bad linkage between these two categories of agricultural technology – both can serve to make crop production better.'

It's also partly the media's fault, says Dr Van Eck, that so much weight is given to anti-GMO scaremongering. 'The media are at fault here for wanting to write "balanced" stories, giving equal weight to two sides of a perceived issue. In fact, there is no scientific controversy here. Instead, the scientific consensus suggests that the process of genetic engineering poses no threats to human health.'

Q IS GMO THE ANSWER TO WORLD HUNGER?

Sort of. According to the UN, food production needs to double by 2050 to meet the demand of the world's growing population. Genetically modified crops are one of many possible solutions to world hunger, but in the absence of better distribution and infrastructure, the higher crop yields that some GMOs can deliver (about 7–20% more than conventional crops, and an average of 33% more than organic crops) cannot be ignored.

Q DO PEST-RESISTANT GM CROPS REQUIRE LESS PESTICIDE?

Yes, in some cases. GM plants that produce a toxin which is poisonous to some insects but harmless to humans have many benefits – one of which includes a reduced need for pesticide, which also means natural insect predators are able to thrive and spread. According to the Genetic Literacy Project, a non-profit US organisation, biotechnology saves the equivalent of about 236 322 kilograms of pesticides each year and helps cut herbicide runoff by 70%. In addition, adds Dr Van Eck, the type of pesticides used in conjunction with GM crops are far less harmful to the environment than alternative chemicals sprayed on conventional crops (without GM traits).

To put things in perspective, though, agricultural scientist Steve Savage recently wrote on BioFortified.org (another independent, non-profit organisation devoted to providing factual information about issues in biology): 'A biotechnology trait may decrease or increases the need for a pesticide. There will also be many cases where the biotech trait has nothing to do with pesticide use. There is no necessary good or bad linkage between these two categories of agricultural technology – both can serve to make crop production better. Both are options that should be available to those who farm.'

Q AREN'T GM CROPS ONE-OFFS – IN OTHER WORDS, THEY DON'T PRODUCE SEEDS?

No, they're not. Companies like Monsanto HAVE developed Genetic Use Restriction Technology (GURT, also called 'terminator' or 'suicide' seeds), which are seeds that grow into plants whose seeds are sterile, so they cannot be collected to plant a second crop. However this technology has not been commercialised – in fact, in 1999 Monsanto made a commitment not to commercialise sterile seed technology in food crops, and has stood by this.

Q ORGANIC FOOD IS MUCH SAFER THAN GM FOOD THOUGH, RIGHT?

This may come as a shock, but no. In fact, there have been far more deaths from contaminated organic food than GM food. Again, there has not been one single reported death or harm to health from GM food – but in February this year Taylor Farms in the US had to recall its organic baby spinach from 39 states after an E. coli scare. UK supermarket chain Sainsbury's also had to remove watercress (some of which was organic) from its shelves after 15 people fell ill from the E. coli bacteria in September, and let's not forget the 50 deaths in 2011 caused by an E. coli outbreak in Germany that was traced back to an organic bean sprout farm.

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But the question of organic vs GM food is itself misleading, since GM and organic ideals are not incompatible. 'The GE crop varieties of the near future will be adapted to local climate and soil conditions,' says Dr Von Eck, 'as well as local tastes and cultural idiosyncrasies. As such, the new generation won't solely be developed by large multinational corporations like Monsanto, but also by local universities and small family-run businesses, and a significant proportion of these biotech crops will be cultivated using organic farming practices.'

These predictions may seem far-fetched, he says, but they really aren't. Scientists and government agencies are trying to stem the tide of misinformation out there, as well as the fear-mongering that is threatening one of the greatest tools for achieving the UN Millennium Development Goal of sustainably feeding a growing global population. ✤

PHOTOGRAPH: GALLO IMAGES/GETTY IMAGES

SOURCES: 'GOOD SCIENCE, BAD SCIENCE, AND THE BATTLE FOR BIOTECH CROPS' AND 'EMBRACE THE BIOTECH IN YOUR BASKET' BY DR. LEON VAN ECK; THE GENETIC LITERACY PROJECT; FORBES.COM