With the emergence of new genetic engineering techniques – or GMO 2.0 – new genetically engineered organisms can be created more cheaply, easily and quickly than ever before. These techniques are being used to change our food system, with still unknown consequences.

SYNTHETIC BIOLOGY

With synthetic biology, or 'synbio', new DNA strands can be created on computers, printed off on 3D printers, to create new life forms. The term is also applied to a way of reengineering living organisms to perform functions they wouldn't do naturally.

A number of synbio projects are already producing fuel, plastics, fabrics and industrial chemicals. The food system, however, is arguably one of the biggest targets for the synthetic biology industry. Current applications for synbio include oils for food processing (including for supplements, baby foods and formula) and the much-publicised plant blood (or 'heme') for the fake meat Impossible Burger.

Synthetic biology versions of common ingredients such as vanilla, saffron, stevia, coconut and cocoa and a variety of other flavourings and fragrances – are in the pipeline. These food products are being introduced to the marketplace – not through supermarkets but through the food service sector. Restaurants, looking for something new and novel to offer their customers, have willingly become the marketing arm of the synbio industry, in some cases selling foods that have yet to gain regulatory approval.

Some of these synthetic organisms are unlike other naturally occurring organisms – a fact that makes the process risk assessment difficult, if not impossible.

Synbio organisms multiply faster than normal organisms and although they are produced and contained in laboratories, escape poses real risks to the wider environment where their modifications could be passed on to other organisms. They are also are being promoted as a kind of open source/DIY genetic engineering, with instructions downloadable from the internet, taking them outside the preserve of formal science.

NEW BREEDING TECHNIQUES

'New breeding techniques' (NBTs), refers to different techniques and ways of applying genetic modification in plant breeding. All of these involve genetic engineering. They are sometimes wrongly referred to as 'New Plant Breeding Techniques'. However, producing plants this way is not plant 'breeding' in the sense that most farmers and growers understand and practice it.

Even though they are called 'new' breeding techniques many make use of older genetic modification processes. But the term is also used to indicate any type of GM application or technique that had not been commercialised by 2001, the year when the existing EU directives on genetically modified organisms (GMOs) came into force. For this reason, there is extreme lobbying pressure from biotech companies to exclude them from existing regulations and legislation.

A 'gene editing' technique known as CRISPR is often used in synthetic biology and is also the most well-known of all the NBTs. It is a type of genetic engineering which can be easily be used by researchers to make minute changes in a genetic code. This technology is touted as being a more precise type of genetic engineering. However it is important not to confuse the concept of 'precise' with 'predictable'. The results of genetic engineering are never truly predictable.

A single gene has multiple functions, thus a single change in the way a gene functions can have multiple and profound results throughout the organism. Such changes, when they occur in the human genome are responsible for complex diseases like cystic fibrosis, haemophilia and sickle cell anaemia.

Because the results of GMO 2.0 are no more predictable than older style genetic engineering it will be difficult for regulators to test for unexpected or 'off-target' effects.

Where food is concerned, the end product may look exactly like a naturally bred or grown food, but it may be producing toxic by-products, or have less of certain nutrients. With genetically modified animals there can be unpredictable adverse effects on growth and reproduction that can significantly impact welfare and wellbeing.

In addition, some NBTs, known as gene drives, have the potential to spread genetically engineered genes through wild species causing massive ecological disruption and even "re-engineering" entire populations.

REGULATION REQUIRED

Proponents of new genetic engineering techniques are looking to open up a lucrative market and avoid the continuing public scepticism surrounding GMOs.

It's worth remembering that the name 'genetically modified organism' came into being as a way of removing the word 'engineered' and replacing it with the more neutral 'modified' which made the technology seem less invasive and extreme.

By calling new genetic engineering techniques by other names e.g. 2.0, synbio or NBT – and by using words like 'tweaking' or 'editing' instead of 'engineering' – biotech companies hope to avoid both public backlash and necessary regulation that comes with these new technologies. If this happens the resulting GMOs would then not be subject to risk assessment and foods containing them would not need to be labelled exposing people and the environment to unpredictable risks.

More than ever we need effective regulation to protect us from all that we don't know and cannot predict about the products of these new genetic engineering techniques. We also need more people to stand up and say 'no' to untested GMOs in our food system.

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