
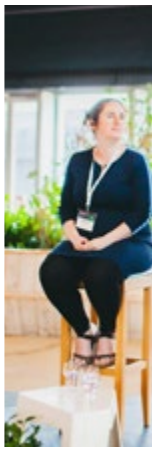

DISCUSSION AT THE INTERNATIONAL CONFERENCE CRISPRCON

Talking about CRISPR-Cas

DNA can be changed with great precision using CRISPR-Cas. The introduction of the technology was discussed at the international conference CRISPRcon in Wageningen at the end of June. The emphasis lay on how to enable the general public to arrive at an informed assessment of its uses.

TEXT RIK NIJLAND **PHOTOGRAPHY** JONNE SEIJDEL

'An exchange of ideas: that is something we sorely need,' says the Wageningen microbiologist John van der Oost as he casts a satisfied eye over the full lecture theatre on the Wageningen campus. Hundreds of participants at the international conference CRISPRcon are thronging around 30 discussion tables to talk about the uses of gene technologies. There are members of religious communities, farmers and students, but the majority are researchers, social scientists and representatives of large seed companies. Van der Oost is one of the pioneers of

The two-day CRISPRcon conference brought a diverse group of people together to discuss the future of CRISPR-Cas and related gene technologies. Hosted this year by Wageningen University & Research, the conference was an initiative of the Keystone Policy Center, which aims to stimulate an open dialogue on gene technology.

CRISPR-Cas, a technique for making precise changes to DNA. In just a couple of years, it has spread to labs around the world. 'It is a marvellous instrument which deserves to be widely used. Of course we must act with the utmost caution but there is no reason for distrust.'

The possibilities are indeed endless, and range from removing a single gene in order to study exactly what its function is in an organism, to treating hereditary conditions in people, arming crops against drought stress or diseases, or adapting plants, bacteria and yeasts so they can produce more or different chemicals and drugs. But a few of the speakers emphasized that none of this makes the new technology an indispensable miracle cure. To tackle hunger in the world, let's start by doing something about the 40 per cent of food that ends up in the bin, suggested one organic farmer.

CRITICAL VOICES

Another critical note came from Alejandro Argumedo of the non-profit organization ANDES. 'We have no need for more genetic diversity through CRISPR. Four hundred varieties of potato are grown in Peru. They are part of life for us. Sustainability means respecting nature and the way people live with it. Western science is not the only way of looking at the world.'

> 'We have no need for more genetic diversity through CRISPR'

But such critical voices did not set the tone of the conference. Instead, the emphasis lay on how to enable the general public to arrive at an informed assessment of the uses of modern DNA technology. Discussion about this has become unavoidable. Last year the European Court of Justice handed down a ruling on the technology (see inset). There is no ban on changing genetic material with CRISPR, but the safety rules for marketing food products are strict. So strict that companies are put off by them or cannot afford the admissions procedure. The rules are far more relaxed in Asia and the US. It is high time the legislation was changed, say CRISPR fans. The EU commissioner for Health and Food Safety Vytenis Andriukaitis made a start on that during CRISPRcon by calling for a Europe-wide debate. But that idea sets off alarm bells for a lot of people. Around the turn of the century, discussion of genetic modification – using less precise precursors of CRISPR – led to 10 years of trench warfare between the two sides. The wish to avoid the same thing happening with CRISPR was palpable at CRISPRcon.

ALL THE WRONG FEELINGS

Wageningen president Louise Fresco took a historical perspective too. 'Imagine if the first use of genetic modification in agriculture had been a variety of wheat with a built-in carbon gene that provided protection against cancer of the stomach. The discussion about the use of GMOs in the food chain would undoubtedly have taken a very different course.' In that scenario, the public would have seen advantages to a new and perhaps rather scary technology, and not just the disadvantages. As it was, any advantages were not very clear to the general public, said Fresco. The technology was applied in the production of modified maize and soya, livestock feed crops grown in large-scale monocultures. So it mainly benefitted a handful of large agrochemical companies. 'That triggered all the wrong >

feelings,' said Fresco. 'It would be good for acceptance of CRISPR-Cas to look for a few applications that make a real difference to people.'
This was a frequently voiced view at the two-day conference in Wageningen. You don't win people over with impressive techniques but with convincing applications. What will this genetic change do for your health, how will it benefit the environment, will it improve life for farmers in developing countries? The emphasis on safety is a pitfall: there is no such thing as 100 per cent certainty, there is always room for doubt.

> **'Past experience shows you should conduct an open dialogue about gene editing'**

GENE EDITING, NO WAY

According to Anita van Mil of the London social research firm Hopkins Van Mil, interaction with the public should never be brief and superficial. 'If you ask people at a festival a few questions about a topic they don't know much about, they go on the defensive. Gene editing, what? No way. But what if you ask them what they would think of an intervention using this technology if a member of their family had a hereditary disease? Or whether they would want the technology used for plant breeding in a country suffering from famine due to climate change? Then they start thinking.'
The firm did a study for the Royal Society on gene editing's public image in the United Kingdom. With Brexit in the offing, the British are going to need their own legislation. So the scientific academy wanted to know what ideas people have on the subject and how they form their opinions.
'In several parts of the country, groups of 20 to 30 people took part in discussions, with experts available to answer questions,' explains Van Mil. 'Then the participants were given homework and we encouraged them to talk about gene technology with their families and friends before coming together again three weeks later. People's ideas had often changed. Cut through the one-liner lunacy of the media, especially in the UK, offer balanced information and give people time to think about it. As researchers we are neither for nor against gene-editing; we are neutral partners who want to conduct a constructive public dialogue. Your aim should be to establish openness.'

TESTING USEFULNESS

During CRISPRcon, Michelle Habets of the Rathenau Institute led a discussion entitled 'Let's avoid a trench war on CRISPR food' – a reference to the shadow of the past. The institute argues for making usefulness a factor in approving new food products, and not just safety. The proposal is based on a Norwegian approach to assessing biotechnological innovations. 'Is it just a small "point mutation" or is DNA from another organism introduced? The social implications should play a role in approval procedures too. Will the product increase sustainability, for example, and is it good for



small farmers in the South? If not, do we really want that product?' According to Habets, these are the conditions for responsibly integrating gene technology into agriculture and society. A general exemption, argued for by some proponents, offers no guarantee that the fabulous promised applications of the technique will ever be realized. When push comes to shove, the plant-breeding industry might prioritize upscaling production and increasing profit margins over a drought-resistant crop that benefits poor farmers. In the Norwegian model there is an incentive. 'Besides, countries can make their own decisions as to whether they accept a product, taking cultural differences and their own ethical choices into account.'

LOGISTICAL NIGHTMARE

For Europe to become a patchwork of different accepted food products strikes Hinse Boonstra, agricultural affairs manager at Bayer, as far from ideal. 'For the industry and for transportation that will be a logistical nightmare,' he says. He came to Wageningen with seven of his colleagues. 'Gene editing is important to us as a plant-breeding company. Past experience shows the need for a good, open dialogue about the subject. If you fail to do that, the chances are that you won't be able to use a sustainable technology that can be extremely beneficial to farmers and consumers.'

And this hampers innovation, says Boonstra. A multinational like Bayer works all around the world, but smaller European companies and farmers can't get experience of new products and varieties that are allowed in Asia and in the US. Or those new varieties are never even introduced. For many crops, a new variety is only viable if it can be marketed worldwide.

He didn't find any readymade answers in Wageningen. 'There are so many different parties, each with their own ideas about what agriculture and food production should look like. That makes it very complicated,' says Boonstra. 'It became obvious at CRISPRcon that an open dialogue is needed. It would be great if that at least generated an appreciation for everybody's position. That would hopefully create space for letting different visions co-exist: farmers who do use gene editing and farmers who don't, consumers who do or do not wish to buy those products. There simply isn't just one truth.' ■

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GMO LEGISLATION

The discussion about genetic modification that flared up in Europe in the 1990s was mainly about applications in agriculture and the food industry. The environmental and organic agriculture movements strongly opposed 'Frankenstein foods' produced from plants that had been enhanced with a gene from another species. In the end, the EU developed strict GMO legislation 15 years ago, with a strong emphasis on safety for humans and the environment. Wageningen hoped the European Court of Justice would make an exception for certain applications of the new CRISPR-Cas technique, as had happened in the US. There the technique is not seen as genetic modification if it is used for point mutations that are indistinguishable from natural changes in the DNA. But the European Court of Justice ruled last year that European legislation leaves no scope for that, so CRISPR falls under the severe GMO legislation.