Conference on

CRISPRing – A New Beginning for the Genetic Improvement of Plants and Microbes

Budapest, 3–5 September 2018

https://crispring.agrar.mta.hu/

Policy Briefing Notes

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This timely and important conference on "CRISPRing – A New Beginning for the Genetic Improvement of Plants and Microbes" profoundly demonstrated the importance of genome editing to agriculture and environmental protection and sustainability. Genome editing encompasses a range of different techniques that offer a uniquely precise and fast way to help the development of plant varieties and microbes get ahead of the rapidly spreading losses of harvest due to drought and diseases that are already causing immense economic losses and crises around the world.

To the meeting delegation of over 130 world-leading plant- and microbe-scientists from over 20 countries, who have provided real-life evidence and discussion input to this conference, genome editing represents first and foremost a much needed opportunity to improve the pace and the accuracy of gene function studies that have formed the underlying principle of breeding strategies since Gregor Mendel described the first rules of (genetic) heredity in the 19th century. The scientific results presented and discussed at this conference included – among others – the development of drought-resistant barley, the increased yield of starch-production in potatoes, and the improvement of yeast-cells for both wine-making and for the widespread deployment of fossil-fuel replacing factories play a pivotal role in enabling the much demanded bio-economy. A large number of the research presented had been conducted in collaboration with or contracted by regional regulatory bodies. Many presenters added that the potential off-target effects, whose detailed investigations had accompanied their research, had been found to fall within the range of naturally occurring mutations, and in some cases, analyses had provided evidence that these effects had not even been caused by the genome editing technique (i.e. in that case: CRISPR).

The innovation power that genome editing methods in general, and the conference-name-giving CRISPR technique in particular offer to the research community is substantiated in the number of laboratories and companies around the world that have already licensed the technique from one of the two parties that are currently embroiled in a CRISPR patent dispute; such widespread licensing of a technique from an organisation that may ultimately not be awarded a patent shows the value that the genome editing technique provides to laboratories around the world.

The Need for Adequate Policy Considerations

The scientists that have come to Budapest, in order to exchange and discuss their results, represent a global scientific community that is generating new fascinating knowledge in genome editing

applications every day. Such wide-spread adoption is driving a rapid advancement of the research field and its commercial applications, and thereby the requirement for policies concerned with it. During the session on “Regulatory Aspects”, it was highlighted that CRISPR takes a pivotal role in all stages of the science, technology and innovation value chain: (a) basic research, (b) translational/applied research (in a wide variety of systems), and (c) application and commercialisation (by companies). Adequate policy considerations need to keep all of these stages in mind.

Adequate policy considerations also need to keep in mind that for nearly all state-of-the-art innovations the development time between scientific discovery, commercialisation and regulation is rapidly decreasing. This effect is in part enforced by the increasing demand for applied science and the prescribed shortening of the time laps between science and technology, which imposes a growing (financial) dependence of (basic) research on its demonstrable application value.

Last, but not least, adequate policy considerations need to acknowledge the extent to which not only modern-day trade but also all of today’s scientific research is heavily reliant on international collaborations: every scientist and trade expert at the meeting could today and on the topic of genome editing attest to the fact that “no man is an island” (John Donne, 1624); while this is probably true for nearly every aspect of rapidly transformational societal, scientific, technical and economic progress, it has rarely been illustrated better than by the turnout and discussions at this CRISPRing conference.

The ECJ’s Ruling: Not Exactly In Line with Sustainability and Equality

In the case of the CRISPR technique, the journey between discovery and naming of the technique in 2002, its patenting by two independent organisations in 2012 and its regulation by the European Court of Justice (ECJ) on the 25 July 2018 took a mere sixteen or six years. The ECJ’s ruling is somewhat detrimental to the future use of genome editing techniques for the genetic improvement of plants and microbes (in Europe), and the delegation of this conference has aired disappointment and even disbelief in the ruling, but it should nevertheless be accepted as what it is: a statement by that body of the European Union, whose mandate it is to interpret existing law (and not to make new law).

The ECJ’s ruling arguably represents bad news for a number of reasons; these range from a potential detrimental impact on extended fields of scientific research in Europe (i.e. potentially another brain-drain of scientific excellence) to the discrimination against innovation in small companies that cannot afford the lengthy regulatory burden of having to approve a product as a genetically modified organism (GMO) in Europe. Nevertheless, the discussion session on “Regulatory Aspects” demonstrated that the scientific community of CRISPR researchers can do no better right now than to continue its good work in the interest of international collaboration and advancement of the entire scientific field; this should be understood not in the sense of a resignation over the ECJ ruling, but as a sign of “advancement against the odds”.

The Pivotal Role of the Scientific Research Community

The CRISPRing research community that has gathered in Budapest, in order to exchange and discuss the state-of-the-art results achieved using this ground-breaking technique, plays a uniquely important role in the future development of public opinion and policy concerning genome editing in

Europe; the meeting has helped to dissolve some concerns about off-target effects and highlighted a number of wide-ranging benefits that genome editing can help to deliver.

It is no coincidence that the research results presented over these three days focus on providing solutions to some of the most pressing societal and environmental problems communities around the globe are confronted with. It is of utmost importance that the results are communicated in a responsible, balanced manner, so that they can be regarded in the context, in which the underlying research had been initiated, namely to test and demonstrate CRISPR's innovation potential to tackle some of the world's most important challenges: the evidence presented and discussed at this conference included (but by no means exhausted) the application of the technique to provide the following benefits:

- Inclusivity and Equality:
    - Small companies can license and apply genome editing to provide innovative value.
    - Poorer countries can license and apply genome editing to innovate independently.
- Food Security:
    - Genome editing can help to counteract the increasing loss of genetic variety and the detrimental effect of inbreeding depression upon selfing.
    - Both the developing and developed world countries can apply genome editing technique to develop individual solutions to their very own problems of crop losses through droughts and diseases.
- Sustainability:
    - Genome editing provides one of the most promising possible solutions to lowering the agricultural use of pesticides and fertilisers, while simultaneously meeting the nutrition needs of growing and increasingly urbanised populations.

This excellent CRISPRing meeting and the amount of knowledge exchanged through it within just three days demonstrates that the best action the scientific community can take is to continue doing what it does best: conduct novel research work with and on CRISPR in particular and other genome editing techniques in general, thereby gathering evidence and knowledge that addresses both the public and the regulatory concerns surrounding this new suite of techniques. In doing so, the scientific research community will provide its best possible support to those that will hopefully soon try to make the case for a different ruling on genome editing (through whichever body or development this may be possible).