Brief Note on Convention on Biological Diversity

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Description

Synthetic biology is a rapidly emerging interdisciplinary field of science and engineering that aims to redesign living systems through reprogramming genetic information. The field has catalysed global debate among policymakers and publics. Here we describe how synthetic biology relates to these international deliberations, particularly the Convention on Biological Diversity (CBD).

Convention on Biological Diversity

Synthetic biology or engineering biology is a fast-moving field that embraces and drives state-of-the-art technologies for designing and reconstructing livings systems at different scales, primarily by reprogramming cellular genetic information. As such, the field has catalysed global debate among the wider circles of legislative policymakers, including multiple international conventions, treaties, and protocols. Various international treaties and organisations are currently examining the impacts of synthetic biology and engineered gene drive systems on their respective agreements. One main United Nations (UN) convention of importance to synthetic biology is the UN Convention on Biological Diversity (CBD). In simple terms, the CBD has three main objectives: (i) conservation of biological diversity, (ii) sustainable use of its components, and (iii) fair and equitable sharing of benefits arising from the use of genetic resources. Since 2010, the CBD has discussed whether synthetic biology should be classified as a new and emerging issue and its objectives and activities are of considerable importance to the synthetic biology research community.

For example, one objective of the CBD is to grant sovereign rights of countries over their genetic resources. Furthermore, the CBD is also deliberating whether or not new/adapted regulations are needed for synthetic biology, how access and benefits sharing agreements (ABS) should be managed with digital sequence information (DSI) and also whether or not moratoriums on synthetic biology research and/or applications to the environment should be implemented. The CBD is also debating whether the products of synthetic biology should be considered under the convention, in addition to the process or technology used to produce them. The synthetic biology community should follow these deliberations closely and take the opportunity to engage directly within these processes.

The recent report commissioned by the Plant Treaty has a number of key findings. There are three main broad themes: (i) mining plant genomic information for gene editing in agriculture, (ii) mining for use outside of agriculture, and (iii) using the plant as a 'workhorse' to produce other products. A large amount of DNA sequence data is already widely available and easily exchanged, which raises significant challenges to the ABS logic of identification and the different expectations of monitoring. With new genetic technologies, the ABS system cannot rely on the link between physical material and data to identify ownership and location, so monitoring DSI exchange is very challenging. Other complications are the use of partial sequence combinations and duplication of sequences in multiple organisms.

Synthetic Biologists

Access to material under the multilateral system is solely for purposes of 'utilization and conservation for research, breeding and training for food and agriculture', and excludes 'chemical, pharmaceutical and/or other non-food/feed industrial uses'. Researchers can effectively use DSI from MLS material in any kind of research, including chemical and/or pharmaceutical, without such usage being easily monitored. Moreover, by using DSI from identifiable published material, the chain of transmission is neither transparent nor documented, and there are no indications that legal innovations such as open material transfer agreements will improve DSI monitoring or assess benefits. While some patents incorporating DSI may provide geographic origin information, others may not, or the information may be hidden.

To encourage equitable sharing and access to genetic materials, researchers generally use ex ante investment to facilitate access to genetic material, public funding for infrastructure investment, facilitated access for research community building, structured research collaboration, and education and training. These strategies could be considered in relation to the Nagoya Protocol and Plant Treaty, as both acknowledge the importance of fair and equitable sharing of benefits arising from genetic resources, through exchange of information, access to and transfer of technology, and capacity-building.

Synthetic biologists directly engage with molecular evolution, from simple genetic point mutations to whole gene deletions, additions, and replacement. More recently, work has expanded to de novo genome synthesis as a result of decreasing DNA costs and the ease of large-scale DNA assembly. There are now a range of reverse genetics strategies available in the synthetic biologist's toolkit.

With the gene drive approach causing particular concern within the CBD and other international conventions. Resolution of these concerns could result in a moratorium on the release into the environment of engineered organisms for specific applications.