Technology to screen for synbio abuses lags

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Amid growing concern that synthetic life sciences pose biosecurity and biosafety risks, scrutiny is increasing into the burgeoning DNA sequence trade. Research published today in the *Bulletin of the Atomic Scientists* looks at the necessity of a global regulator for DNA trade, and the significant barriers to creating one.

Synthetic life sciences are making breakthroughs at a breakneck pace, and could offer technological fixes for our future ecological, technological, and biomedical challenges. But these benefits also come at a price.

Gabrielle Samuel of the Centre for Biomedicine and Society, Kings College London, UK, along with Michael Selgelid, of the Centre for Applied Philosophy and Public Ethics (CAPPE) at Australian National University in Canberra and Ian Kerridge from the Centre for Values, Ethics and the Law in Medicine at the University of Sydney, Australia, argue that the synthetic life sciences are not entirely benign. Their paper addresses regulatory options to respond to valid fears that this technology enables the synthesis of pathogenic agents, which could be used as biological weapons.

Policy recommendations on regulating the DNA sequence trade have generally focused on the regulation of longer, gene-length DNA sequences: It is easier to determine the nature of longer DNA sequences (i.e., what genes they contain and which organism, pathogenic or not, they come from). Further, the technology required to produce them is still relatively limited worldwide, and is often used in the synthetic life

sciences.

At present there is no globally harmonized system to ensure all sales from DNA companies are for approved purposes. In Germany and in the United States, firms are required to limit the synthesis and delivery of specific, potentially dangerous DNA sequences to those researchers and institutions authorized to receive them. Many gene synthesis have a voluntary customer and order screening system in place. But in general, current screening practices are non-uniform and disorganized.

Samuel et al believe there is a strong case for creating a global clearinghouse to oversee centrally all DNA sequence ordering, and provide a better means of regulating the DNA sequence trade. The benefits include detecting when different companies are used for multiple orders; crosschecking national and international databases; and screening individual orders for inconsistencies.

Unfortunately, the technology required for an effective clearinghouse is not currently available. The present regulatory technological capability for the synthetic life sciences is, at best, embryonic. Existing screening software efficiency is low (generating too many false positives); screening processes are too easily evaded; and there is no agreed procedure for investigating and managing suspect sequence orders. The onus is on current policy makers to make developing better technology a priority.

"The biosecurity threats posed by the synthetic sciences are very real, and yet efforts to counter these risks are hindered by limitations in existing technology and by failure to develop biosecurity responses that cross national borders and bypass national interests," says Samuel. "It is crucial that political and financial support is made available to advance public policy in this area and to hasten the development of better regulatory technology."

Synthetic genomics is the chemical synthesis of DNA sequences. The synthesized sequences can already exist - as in the chemical synthesis of genes naturally found in an organism - or it can involve the synthesis of novel, unnatural DNA sequences. Synthetic biology is both the design and construction of new biological parts, devices, and systems and the redesign of existing natural biological systems for useful purposes.

Because the synthetic life sciences may enable the synthesis of biomolecules, whole genomes, and even simple life forms, these sciences have enormous potential, as they may logically be applied to any area of science or biomedicine that uses or works with genetic components, including pharmaceutical development, fuel production, detoxification of chemicals, genetic therapy, and environmental control.

More information: Back to the future: Controlling synthetic life science trade in DNA sequences by Gabrielle Samuel, Michael J. Selgelid, and Ian Kerridge is published today (16 September 2010) in the Bulletin of the Atomic Scientists, 66(5) 1.

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