A conversation with Dr. Gigi Kwik Gronvall, October 6, 2014

Participants

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Note: These notes were compiled by the Open Philanthropy Project and give an overview of the major points made by Dr. Gigi Kwik Gronvall.

Summary

GiveWell spoke with Dr. Gronvall of UPMC's Center for Health Security as part of the Open Philanthropy Project's investigation into Dual-Use Research of Concern (DURC). Conversation topics included:

- What to include under the umbrella of DURC
- Potential DURC-related threats
- The current DURC policy in the U.S. and potential policy reforms
- Room for foundation involvement in DURC policy formation

DURC Overview

It is difficult to provide a comprehensive account of, or develop a strategy for addressing, DURC because the term itself is subjectively defined. Whether to include synthetic biology (SynBio) within DURC, or focus exclusively on issues such as gain-of-function (GOF) research, is debatable. Dr. Gronvall takes a broad approach to DURC because issues similar to GOF have arisen in the past and proven to be short-lived concerns. From a biosecurity perspective, it is not advisable to restrict efforts to address DURC to single problems such as GOF.

This lack of clearly defined parameters leads to great variation in the amount of concern DURC elicits. In general, DURC is problematic because of its potential for either deliberate misuse or accidental catastrophe.

GOF research is currently the primary biosecurity concern in DURC but there have been others in the past. Previous prominent areas of DURC included:

- Mousepox
- Anthrax
- Smallpox genes injected into chickenpox

Paleovirology, the investigation of extinct viruses, is also a prominent area of DURC. Paleovirologists work on recreating these organisms in the laboratory.

Gene drives are another area of research that may pose dual-use concerns. Gene drives could potentially be used on mosquitos in order to introduce malaria resistance into the wild. This research needs to be thoroughly examined before trials occur. This could be achieved if foundations support policy oriented research on DURC and promulgate the results.

SynBio

SynBio is a growing area of DURC. Technological advances are lowering the barriers to this work and increasing the chances that it could be misused. As it becomes easier for independent researchers to replicate SynBio experiments, it is more likely that individuals without sufficient training and expertise could engage in dangerous research.

Dr. Gronvall is also concerned about the growing imbalance between the amount of work in SynBio performed by the U.S. and other countries, notably China. For example, the amount of gene sequencing capacity and data held by BGI (formerly the Beijing Genomics Institute) is potentially worrisome.

The threat of DURC

In a worst-case scenario, DURC could lead to a pandemic. The 1918 flu pandemic had a mortality rate of 2.5% to 5% and caused up to 100 million deaths. If a pathogen with a much higher mortality rate, such as a modified H1N1 virus, caused a future pandemic, the total mortality could be much higher.

Absent the deliberate misuse of research, a severe enough accident could drastically alter the funding for and public perception of biological research. Safety improvements as a result of such an accident could be beneficial, but it is to be hoped that such a disaster would not be necessary before preventative measures are taken.

DURC policy in the U.S.

U.S. government policy does not adequately address the potential problem of DURC. Current regulations focus exclusively on vetting research on a small number of pathogens and toxins. These especially virulent pathogens deserve special attention, and focusing on a small number of pathogens makes the policy easier to enforce, but these pathogens are already thoroughly regulated.

This policy does not address the broader issues of the deliberate misuse of research or unsafe research practices. Researchers who work with dangerous pathogens are already aware of issues surrounding DURC. Researchers whose work is not immediately recognizable as DURC-related are probably the biggest concern and not addressed by existing policy.

Limited though it is, this policy is different from other extant proposals for DURC regulation because it is actionable.

The following agencies and bodies work on DURC policy in the U.S.:

- **National Institutes of Health (NIH)** – funds DURC related research
- **Office of Science and Technology Policy (OSTP)** – an office in the Executive Office of the President
- **Centers for Disease Control and Prevention (CDC)** – monitors DURC on select agents
- **United States Department of Agriculture (USDA)** – monitors DURC on select agents
- **Institutional review boards (IRBs)** – IRBs at individual research institutions vet research proposals

IRBs cannot perform their function adequately when they are underfunded and inadequately staffed. They frequently do not have enough resources and this can impede research.

How to address the DURC policy gap

It is difficult to determine the appropriate policy response to DURC. It may be the case that there is no comprehensive policy approach to DURC. Instead it may be most advantageous to focus on developing plans for addressing the consequences of DURC. This could take the form of policies preventing access to the results of DURC in order to protect against misuse or irresponsible actions.

Improved safety protocols are the most tractable means of limiting the potential impact of DURC. Developing and enforcing more robust safety regulations would be easier than attempting to prevent dangerous research from occurring. The primary policy focus on DURC should be on developing and implementing more rigorous safety protocols. This is particularly important for research in places that lack the resources to develop their own safety protocols.

Dr. Gronvall advocates the creation of a program run by the National Science Advisory Board for Biosecurity that would help scientists working on DURC. A national oversight and education program of this sort would make it possible to develop a better understanding of the threats and who the potentially irresponsible actors are.

There is no requirement for gene foundries to screen their customers and there is a market for these unregulated foundries. This allows individual researchers without any institutional affiliation or known connection to the do-it-yourself-biology (DIY-biology) community to operate without any oversight. It may be necessary to develop a means of monitoring these researchers.

Before any reform can occur, it is necessary to determine what the components of DURC policy should be. There is no expert consensus on how to address DURC. Biosafety associations from around the world need to work in conjunction with governments and the World Health Assembly to develop a policy framework.

Areas in which policy reforms could prove effective include:

- Education
- External review of research
- Review prior to publication
- Codes of conduct for researchers

Dr. Gronvall does not favor requiring biosafety level 4 (BSL4) for more areas of research. BSL3 is appropriate and sufficient. BSL4 requirements would likely make some important research unduly burdensome.

Dr. Ben tenOever's approach of "molecular biocontainment" might limit the potential risks from GOF experiments, but researchers might reasonably be concerned about whether the approach could affect the outcome of their experiments. Even if controlled experiments were done to show that using a molecular biocontainment approach didn't affect experimental results in some pathogens, researchers could wonder whether tenOever's technique would affect the outcomes of experiments on new pathogens where such experiments had not been done.

Foundations

The primary space available to foundations interested in DURC-related problems is the development of new safety protocols and systems.

Foundations could take on the responsibility of educating the DIY-bio community. The people engaged in DIY-bio work are not always aware of the security issues associated with the activity. Although these people are generally not engaged in sophisticated work at present, they probably will be in the future. The laws and regulations governing this activity may need to be updated.

Meetings and conferences are a powerful means of influencing people and could be effective. There are fewer DURC conferences currently than there were in the past because of reduced funding from foundations and the government.

Foundations that are, or have been in the past, involved in funding DURC-related work include:

- **Alfred P. Sloan Foundation** – The Sloan Foundation was formerly the leader in funding research on biosecurity. It has largely ended its involvement in this area and is in the process of closing its program on synthetic biology.

- **John D. and Catherine T. MacArthur Foundation** – The MacArthur Foundation provides funding for research on DURC.
- **Smith Richardson Foundation** – Funds policy research on planning for exigencies of biological warfare.
- **Skoll Foundation** – Funds public health research on related issues.
- **Foundation for Vaccine Research**

Other people to talk to

- Carrie Wolinetz – Deputy Vice President for Federal Relations, American Association of Universities
- Kathleen Vogel – Associate Professor, Department of Science & Technology Studies, Judith Reppy Institute for Peace and Conflict Studies, Cornell University
- Gregory Koblentz – Associate Professor, College of Humanities and Social Sciences, George Mason University
- Simon Wain-Hobson – Professor, Department of Virology, Institut Pasteur; Foundation for Vaccination Research
- Gary Ackerman – Director, Special Projects Division, National Consortium for the Study of Terrorism and Responses to Terrorism, University of Maryland

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