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Next Generation Biosecurity for Asia: Keeping up with the Biotechnology Boom by Jaime Yassif

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A global infectious disease outbreak involving a lethal pathogen – whether spread through a deliberate attack or originating from natural sources – could claim thousands to millions of lives and cause severe economic damage. It is essential not only to mitigate the consequences of an infectious disease pandemic, but also – with respect to deliberate biological attacks – to minimize the likelihood that it will happen in the first place.

An important, yet underdeveloped, tool for protecting against biological attacks is effective governance of life sciences research. Biotechnology has the potential to yield tremendous benefits, including improvements to public health and new sources of energy. However, this promise is accompanied by the risk that biotechnology will be exploited to develop weapons that target human health – often referred to as the 'dual-use dilemma.' Improved life sciences governance can help manage this dual-use risk.

A new approach to life sciences governance is needed worldwide, yet this issue has particular significance for Asia. The biotech industry, which is regarded as an engine for economic growth and job production, has been expanding rapidly in Asia during recent years. According to Biodesic, a consultancy with expertise on the bio-economy, China is investing heavily in its domestic biotechnology industry and this sector is projected to grow to 5-8 percent of gross domestic product by 2020. Biotechnology in Malaysia reportedly constitutes 2.5 percent of national economic output, and Indonesia has set its sights on developing robust domestic research and development capabilities as well. In the wake of this rapid growth, policy and regulatory frameworks to manage associated risks need to catch up.

Managing the risks associated with the life sciences presents several challenges. First, dual-use biotechnology tools, materials and knowledge are widely distributed, and research on potentially dangerous pathogens takes place at thousands of facilities worldwide. While these materials and tools are being used for legitimate research, their broad distribution lowers the bar for access and increases the risk of exploitation by groups with malevolent intent.

Second, while producing an effective biological weapon is not a trivial task, the technical barriers are considerably lower than those for nuclear weapons. Biological weapons are well within reach of non-state actors. Furthermore, some features of lethal pathogens – which can be found in natural repositories in the environment, and which reproduce and change over time – render many of the traditional nuclear security paradigms, such as physical protection, inadequate for biosecurity. It is not possible to simply 'lock down' dangerous pathogens worldwide. A different approach is needed.

Finally, rapid advances in biotechnology make effective governance of the life sciences a moving target. A major source of concern in recent years has been the feasibility of producing a lethal virus from scratch – using basic chemical components without a natural template. This capability is currently limited to trained scientists at well-funded research centers, but as technology develops over the coming decade this capability may become more widely accessible – making it easier to obtain deadly viruses whose distribution is currently restricted.

Managing the security challenges posed by advances in biotechnology and its expanding role in the global economy will require a life-science governance strategy that can continue to evolve with these developments.

The limitations of current governance strategies were illustrated by the recent controversy over research on the H5N1 avian flu virus, which demonstrated how the genetic code of this lethal virus could be changed to enable airborne transmission among humans. This led to a vigorous debate not only about publication of this research, but also whether it should have been conducted in the first place. The institutions tasked with evaluating these questions engaged in a messy decision-making process that allowed the research to proceed and ultimately enabled the full results to be published. However, there is still no consensus as to whether this outcome struck the right balance between the potential benefits to public health and the risk that this information could be exploited for weapons development. Similar controversies will continue to arise as life scientists persevere in pushing the limit of what is possible in the laboratory.

More effective management of future biosecurity challenges will require a governance approach that incorporates multiple strategies, including: establishing a culture of responsibility among life science researchers, developing self-governance practices for industry, and strengthening national and international institutions to support these efforts. And the success of this approach will depend on engagement of a broad range of stakeholders.

First, life science researchers need to actively participate in the development of this culture of responsibility. It should emphasize the importance of evaluating potential risks associated with planned experiments and encourage consideration of alternative lower-risk approaches to answer scientific questions. There is an emerging international consensus about the value of such a culture of responsibility. Indonesia has taken a leading role by developing a national

code for biosecurity, which it plans to incorporate into the biological science curriculum nationwide. However similar codes have yet to be developed and implemented elsewhere, and biosecurity has not been incorporated into the training of life scientists at most universities.

Second, the biotechnology industry should develop self-governance strategies to prevent the distribution of materials or technology that could facilitate bioweapons development. For example, DNA synthesis companies currently screen the sequences of customer orders so they do not inadvertently provide the genetic building blocks of a lethal virus. As the DNA synthesis industry expands in Asia, these self-governance approaches should be widely adopted. Indeed, two Shanghai-based companies, ShineGene and GeneRay Biotech, have signed onto the code of conduct for gene synthesis drafted by the International Association of Synthetic Biology.

Third, engagement of national governments and international institutions is necessary for effective life sciences governance. National funding agencies and biosecurity advisory boards need to find a way to efficiently evaluate potentially dangerous research to determine if the benefits justify the safety and security risks. International institutions such as the Biological Weapons Convention have expanded their missions to include managing the international security risks associated with rapid advances in biotechnology. The ASEAN Regional Forum is also developing guidelines for DNA synthesis firms in response to the expansion of this industry in Asia.

Finally, nongovernment organizations have the necessary expertise and time to develop new life science governance strategies for national and international institutions to implement. These organizations need stronger financial support from foundations to ensure that this work moves forward.

Many of the tools for life science governance, and for biosecurity more broadly, have yet to be developed. This is fertile ground for cooperation across the Pacific, and it presents an opportunity for life scientists, policy makers, industry, and nongovernment organizations to work together.

This piece draws on information in the Pacific Forum Biosecurity Lexicon, a primer on technical concepts and an overview of the current status of biosecurity policy in the US and Asia. The Biosecurity Lexicon is produced by Pacific Forum CSIS Young Leaders and is available on the web at [http://csis.org/publication/issues-insights-vol-12-no-11].

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