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# Royal Society activities on reducing the risk of the misuse of scientific research

## 1 Introduction

This paper summarises activities undertaken by the Royal Society on reducing the risk of the misuse of scientific research. It discusses the major themes and challenges that have emerged during this work and some possible next steps.

Concerns have been raised over the control of dual use research in the life sciences, particularly given the failure of States to agree upon verification procedures for the Biological Weapons Convention (BWC). Dual use concerns arise where there is a risk of the misapplication of information, products or technologies from scientific research for harmful purposes.

It is important that discussions of dual use issues in the life sciences are taken forward in the context of the BWC, which embodies the international norm prohibiting biological weapons and promoting biosecurity. The universal application of Article I of the BWC covers all naturally or artificially created or altered biological agents or toxins that have no justification for peaceful purposes. Greater implementation of national legislation as required under the BWC would help improve biosecurity worldwide and assistance in this process is one of the key roles of the BWC's Implementation Support Unit (ISU).

## 2 Overview of activities

### *2.1 International*

The Royal Society has a long standing interest in strengthening the BWC. In 2002, the Royal Society responded to the Foreign and Commonwealth Office's Green Paper on this issue, supporting the creation of international scientific advisory panels to improve the efficacy of the BWC (Royal Society 2002). It noted that the rapid pace of technological advancement in the life sciences necessitates a more regular review than is feasible through the formal five-yearly BWC Review Conference process. The submission also stressed that addressing issues of scientific responsibility and ethics in research is an important but complex undertaking, which can only be tackled in a number of complementary ways. One is the agreement of a universal set of standards for research that can be incorporated into internationally supported treaties. Another is a concerted effort to increase awareness of international treaties and codes of ethical conduct amongst researchers.

In 2004, the Royal Society held a joint meeting with the Wellcome Trust, *Do no harm: reducing the potential for the misuse of life science research*, which brought together scientists, funding bodies, learned societies, scientific publishers, journalists, and policy makers to identify how the scientific community could best address concerns regarding the potential misuse of research in the life sciences (Royal Society 2004). This meeting discussed: funding of research; communicating research results; existing and possible future controls and oversight; responsibilities of scientists, including the utility of an ethical code of conduct for life scientists; and training and education.

In 2005, the Royal Society produced a paper on the roles of codes of conduct in preventing the misuse of scientific research (Royal Society 2005a). Another paper was also produced, which provided responses to questions put forward by the UK Ambassador to the Conference on Disarmament in Geneva for discussion at the Meeting of Experts that met in preparation for the 2005 Annual Meeting of State Parties to the BWC (Royal Society 2005b).

In December 2005, the InterAcademy Panel on International issues (IAP) Biosecurity Working Group, of which the Royal Society is a member, developed a statement of general principles to guide IAP member academies and other scientific bodies in developing codes of conduct for specific areas of research (IAP 2005). These five principles are: awareness; safety and security; education and information; accountability; and oversight. The *IAP Statement on Biosecurity* has been endorsed by 71 of the world's national academies of science including the Royal Society.

In September 2006, the Royal Society co-hosted an international workshop with the IAP and the International Council of Science (ICSU) that discussed science and technology developments relevant to the BWC. A workshop report was launched in Geneva in November 2006 to inform delegates to the Sixth BWC Review Conference. Issues covered included: synthetic biology; post genomic technologies; immunological research; drug discovery and delivery; agricultural and environmental biotechnology; and diagnosis and surveillance of infectious diseases. The report stressed the need to strengthen scientific input into the BWC and for mechanisms, such as independent scientific advisory panels and regional scientific meetings and networks, to allow the scientific community to input more regularly into the BWC review process. It also highlighted the need for improved risk management, openness and transparency, education and awareness raising. The challenge to the international community is to manage the dual use risk without jeopardising the enormous potential benefits of scientific advances.

The Royal Society has kept engaged with these issues through membership of the IAP Biosecurity Working Group and participation in related international discussions and meetings such as the *2nd International Forum on Biosecurity* in March 2008.

### *2.2 United Kingdom*

In November 2005, the Royal Society submitted a response to the UK Council for Science & Technology consultation on their code of conduct (Royal Society 2005c). *Rigour, respect and responsibility: A universal ethical code for scientists* was launched in 2006 by then UK Government Chief Scientific Adviser, Sir David King FRS. The key principles of this code include: act with skill and care in all scientific work; take steps to prevent corrupt practices and professional misconduct; ensure that research is justified and lawful; minimise any adverse effect on people, animals and the environment; seek to discuss the issues that science raises for society; and do not knowingly mislead, or allow others to be misled, about scientific matters.

## 3 Major themes

### *3.1 Risk assessments*

It is difficult to predict the nature, potential application and geographical location of scientific advances, especially given the serendipitous nature of research in the life sciences and widespread dispersal of sophisticated research facilities. Technological advances have some potential to reduce the barriers to the development of biological weapons, possibly bringing this capability within the grasp of sub-State groups due to the spread of advanced techniques and a reduction in the costs and expertise required to use them. Research in the life sciences should not be considered in isolation from other scientific disciplines because the development and weaponisation of biological agents may involve techniques from other fields, such as mathematics, engineering, physics and computer science.

Although misuse can be minimised, it cannot be completely eliminated. Nevertheless, the scope and immediacy of the risk of misuse must not be exaggerated. Sensible policies must be guided by critical and realistic risk assessments. Risk management processes to deal with dual use technologies need to be improved. Methods are needed for undertaking assessments across the full spectrum of biological threats, ranging from the deliberate weaponisation of biological agents, through the inadvertent misuse of technologies, to emerging naturally occurring diseases. Also, there should be further investigation of best practice in communicating risks. Risk assessment and management processes would require close interaction with working scientists, who are best equipped to predict and mitigate science based security risks.

A major challenge is how to factor perceptions of the risk, particularly public perceptions, into dual use risk analyses. This is made more complicated since risk environments and risk perceptions differ around the world. The likelihood of malign use of the life sciences and the harm to public health may vary according to the perception of the risks and efforts in individual countries to reduce them. A shared risk methodology and terminology would be particularly useful to understand how countries perceive biosecurity threats differently.

### *3.2 Openness and transparency*

Open communication has been intrinsic to the scientific tradition, providing a forum for validating, repudiating and building upon scientific ideas necessary for intellectual and technological progress. Just because a piece of research is considered to be dual use, this does not mean that it should be prohibited. Rather, this classification serves to emphasise that special consideration may be warranted regarding how the research is conducted and how its results are communicated.

There are a set of communication options, ranging from full and immediate publication, through delayed and/or modified publication, to restricted or no publication at all. These options could be used singly or in combination on a case by case basis. In very rare cases, consideration could be given to delaying publication of highly sensitive information or releasing only some of the information into the public domain. The benefits of taking such action would need to be very clearly demonstrated.

It is a mistaken assumption that censorship of basic research prevents the misuse of advances in the life sciences. Information is likely to be published elsewhere, such as in other journals, websites or conference

proceedings, or communicated informally via e-mail, telephone or face-to-face discussion. Censoring the results of dual use research to prevent proliferation of biological weapons may in fact be counter-productive. Censorship would simply suffocate new research in the life sciences. Greater scientific expertise and understanding, including knowledge of potential harmful applications, is required to combat any potential threat of biological weapons most effectively. Publishing allows for developments to be incorporated into research on countermeasures to biological agents, such as vaccines, and to strengthen public health measures.

Publication is a vital method of communicating results amongst the international scientific community. Many scientists in developing countries are concerned about censorship since access to training, technology and the results of research carried out elsewhere in developed countries is necessary to further the development of scientific capacities in their countries. This highlights the importance of Article X of the BWC, which promotes international cooperation in biology for the prevention of disease, including the free flow of information and scientists in both the developing and developed world.

### *3.3 Education and awareness raising*

It is essential to continue to raise awareness of dual use issues within the scientific community, including amongst academia, government and the private sector. Academic and industrial researchers, as well as university students should be educated, perhaps through bioethics courses, and should be taught about relevant obligations under international law, especially those relating to the BWC. This would help further responsible stewardship in the life sciences and ensure vigilance when work with dual use potential is undertaken.

Ethical codes and codes of practice can be valuable educational and training tools to raise awareness of dual use issues and could be included in undergraduate and post graduate education programmes. However, increasing standards in the wider scientific culture will be a considerable and complex undertaking. A variety of activities other than a code of conduct will also need to be considered, such as producing briefing documents for academic and industrial researchers and supplying packages of information to relevant organisations for their websites. Constant updates on scientific advances and their ethical implications would need to be disseminated. The overall aims would be to increase awareness, open debate and widen perspectives, as well as encouraging vigilance.

Dual use concerns are not limited to the scientific community and its academic journals. Public confidence and trust must not be ignored, and the scientific community needs to work with the media to report these issues responsibly. This is crucial since a major issue is the perception of biosecurity risks, which is determined by the level of public confidence and trust in science.

### *3.4 Codes of conduct*

Codes of conduct could also be useful tools to lower the risks associated with using or transferring sensitive knowledge by helping to develop a strong international scientific culture of responsible stewardship. This requires international strategies to harmonise the varying levels of safety and security regulation and codes of conduct around the world, and raise them to high international standards. One example is the *IAP Statement on Biosecurity*, which highlights fundamental guiding principles for IAP member academies and other scientific bodies when formulating codes of conduct.

It is difficult to produce a code that is both specific enough to have a positive effect and sufficiently flexible to deal with changes in technology or wider applications. It is better to produce more detailed codes of conduct that concentrate on specific areas of research and target a specific audience. It is essential that target audiences are consulted from the outset, including during the drafting process, to ensure that the code will be effectively implemented.

There is some scepticism within the scientific community about the value of codes of conduct. Encouraging the wider international scientific community in the drafting of codes of conduct is important because it will generate discussion about dual use issues. This is valuable to help overcome misperceptions that codes of conduct are just another level of regulation to interfere with their research. National and institutional guidelines and procedures, relating to health, safety and professional conduct, amongst others, already exist but they do not consider the broader ethical implications of research. Codes of conduct should build on these pre-existing guidelines and procedures rather than starting from scratch.

Serious consideration needs to be given as to how to ensure that a code of conduct will be effective. To be effective, codes might need to be enforced. Enforcement is most likely to be through self governance within the scientific community and it is likely that one of the most practical and effective methods of control generated by codes of conduct will be an increased peer pressure from the academic community itself. Key questions that need to be addressed include: Who is responsible for checking a researcher's work? What are the penalties if the code is contravened? What mechanisms are there for researchers, who feel uncomfortable with their work, to report or discuss it? Is whistle blowing to be encouraged and, if so, what mechanisms need to be in place to protect whistle blowers?

## 4 Next steps

Clearly there is much work to be done at the grass roots level, as well as by policymakers, if messages about dual use and biosecurity are to be fully assimilated. Addressing the dual use issues discussed here will require complementary efforts at all levels, from the individual to the international, in order to build a 'web of prevention' against the potential misuse of research (Rappert B and McLeish C eds 2007).

For the life science community this will necessitate engagement at all levels of professional training, and an appreciation of the role to be played by scientists themselves in reviewing the dual use potential of their research. Opportunities for education and awareness raising, such as the development of educational resources and the provision of training courses, should be identified and encouraged. We welcome the increasing involvement of international and national scientific organisations in discussions of dual use issues in Geneva as part of efforts to strengthen the BWC.

## References

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