For Official Use **DSTI/STP/BIO(2008)27**

Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development **17-Nov-2008**

English - Or. English

DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY
COMMITTEE FOR SCIENTIFIC AND TECHNOLOGICAL POLICY

DSTI/STP/BIO(2008)27
For Official Use

Working Party on Biotechnology

BIOSECURITY AND INNOVATION

Progress Report and Next Steps

19-21 November 2008

This document is submitted for discussion at the 24th Session of the Working Party on Biotechnology.

For further information, please contact: Iain Gillespie, Tel: (+33 1) 45 24 92 32; Fax: (+33 1) 44 30 63 36; E-mail: iain.gillespie@oecd.org

JT03255441

English - Or. English

NOTE BY THE SECRETARIAT

This paper, prepared by the Secretariat, reports on progress in 2007-2008 on matters related to biosecurty and sets out further thinking on how to take work forward in 2009-2010. In doing so, it draws heavily on the issues previously discussed at WPB as articulated in document DSTI/STP/BIO(2007)29/REV1.

Members of the WPB delegates are invited to:

- **Notes** the report on progress in 2007-2008.
- **Comment** on the planned December 2008 workshop in China and **consider** participating.
- **Agree** how to move forward with work in 2009 (subject, as appropriate, to new VCs being made available).

OPTIONS FOR WORK ON INNOVATION AND BIOSECURITY[1]

Introduction

1. The 21st century will see a biological revolution similar to the industrial and information revolutions of the 19th and 20th centuries, with potential for advances that are profound and technologically disruptive. Public and privately funded research and development activities in the life sciences are expanding globally at the same time as rapid increases occur in biotechnological applications. These trends have already delivered significant improvements in particular in human health and industrial sustainability and hold the promise of so much more.

2. Such advances have been enabled partly as a consequence of the international proliferation and exchange of biological materials, equipment and knowledge and through the development of underpinning networks and connectivity. Much of the effort of the OECD Working Party on Biotechnology focuses on creating efficiencies in such exchange (to name but a few, WPB's projects on knowledge markets, collaborative mechanisms, emerging research models, and biological resource centres). Such exchange and connectivity is at the core of the new innovation paradigm for the life sciences.

3. However, this self-same proliferation and openness increases the opportunity for, and decreases the cost of, such material and knowledge being intentionally misused to cause harm. This co-called "dual use dilemma" (in some circles, as discussed in paragraph 6, the same dilemma is thought of in terms of "dual benefit") is becoming more widely known in the bioscience community, yet there remain gaps in evidence based policy solutions to address it (with the concomitant risk that the policy response is "knee-jerk" and, so, unbalanced).

4. Scientists and science policy makers have a crucial role in developing strategies to impede illegal access to such materials, equipment and knowledge bases while ensuring that advances in scientific research and in technology continue to deliver successful innovation and the attendant societal benefits in as efficient and effective a manner as possible.

5. Therefore, a scientifically appropriate balance needs to be struck between the system of governance applied to control deliberate misuse and the potential negative effect that such governance may have on sustained access and exchange. Achieving such a "virtuous balance" with innovation has been at the core of WPB work related to biosecurity, both during the articulation of "*Best Practices on Biosecurity for BRCs*" and in the preparation and delivery of the joint OECD/ Russian Federation Workshop in Moscow in September 2006 "*Biosecurity of Microbial Biological Resources – Complementing Innovation*".

6. Got right, such a virtuous balance might reinforce rather than diminish access to and exchange of materials and information (compared to getting the balance "wrong"), and thus resultant innovation.

1. This paper uses "biosecurity" in the sense that it describes measures designed to prevent the loss or theft of pathogens and the toxins they produce from facilities that house them.

Such reinforcement of access is, in the view of the Moscow Workshop, an essential element of any notion of "dual benefit" from biosecurity which needs to be at the core of WPB thinking (the "benefit" referred to in the term "dual benefit" is more often thought about as development of new biodefense markets as well as the indirect societal/security benefits associated with oversight – the effect on innovation efficiency unhelpfully is often inappropriately overlooked in the analysis).

7. This paper summarises progress on work done in 2007-2008 under the auspices of the Working Party on Biotechnology (WPB) to help ensure the delivery of the "virtuous balance" referred to in the paragraphs above. It also presents further thinking on how to take work included in the PWB forward in 2009-2010.

Report on Progress in 2007-2008

8. The PWB for 2007-2008 envisaged that work would be done related to biosecurity in 2007-2008 only if additional specific voluntary contributions were made available. In the event, no such contributions were forthcoming in this period (other than cover for one or two secretariat missions). The situation looks more encouraging for 2009-2010. Nonetheless, some progress has been made by taking such opportunities as have arisen.

OECD Guidelines on Biosecurity for Biological Resource Centres

9. Guidelines were declassified by the Committee on Scientific and Technological Policy (CSTP) and published on the authority of the Secretary General in June 2007. They were posted on the OECD website[2] and made available as a free publication. They have been disseminated fairly widely though further opportunities should be identified and exploited.

Promotion of Guidelines

10. The Secretariat has participated in a number of international meetings on biosecurity though given the lack of new voluntary contributions many more invitations have been turned down than accepted. Highlights included the 11th International Conference for Culture Collections (ICCC-11) on 8-11 October 2007 in Goslar, the meeting of the Network of Academies of Science in Countries of the Organisation of the Islamic Conference (NASIC) *"Biosafety and National Capacity Building in the Ummah Countries"* in Dakar, Senegal (March 2008) and the 2008 IUMS Congress (August, Istanbul) amongst a range of other more focused meetings on biosecurity (including several organised by the National Academies of Science and/or the Inter-Academy Panel).

11. The Guidelines have been universally well received though it has become obvious that greater efforts are required to raise awareness about them. The WHO guidelines - which focus predominantly on biosafety rather than biosecurity – clearly are better known; however, the OECD Guidelines, which strongly complement the former, are not.

Assessment of implementation

12. That said, the OECD Biosecurity guidelines have already had impact and Member countries as well as a number of non-Members have taken steps to implement the substance of the Guidelines. The Guidelines were included by the OECD Council in the "road-maps for accession" for five countries candidate to become members of the OECD (Chile, Estonia, Israel, the Russian Federation and Slovenia). The extent to which these countries have made progress towards implementation of the Guidelines is

[2] http://www.oecd.org/dataoecd/6/27/38778261.pdf

described in document DSTI/STP/BIO/ACS(2008)6 (and its annexes). Document DSTI/STP/BIO/ACS(2008)5 describes progress in OECD Member countries.

13. France, for example, is using the guideline for preparation of a standard authorisation form for the use of micro-organisms and toxins as well as for the preparation of best practice regulations for authorised centres.

14. The European Commission made reference to the OECD work on biosecurity in the context of the development of harmonised minimum requirements on Biosecurity in Europe (for reference see, *Green Paper on Bio-preparedness, Brussels, 200, COM (2007) 399 Final*).

15. Other reactions to the BRC biosecurity guidelines – for example, in the Australia group, are described in paper DSTI/STP/BIO(2007)29.

Biological Weapons Convention

16. The Secretary General was invited by the Chairman of the Biological and Toxin Weapons Convention (BWC) to send an OECD Delegation to their proceedings and BIO staff participated in an experts meeting in Geneva on 18 - 22 August 2008. OECD work on Guidelines was well received as was the intended next steps for WPB (see paras 27 & 28) on risk assessment and on developing the framework for governance for biosecurity. The Secretariat is continuing to develop these links with the BWC Secretraiat as well as with the Secretariat of the committee set up under Resolution 1540 (2004) of the UN Security Council, and of course the WHO.

Synthetic Biology

17. Synthetic biology is the engineering of biological components and systems that do not exist in nature and the engineering of existing biological elements. In simple terms, it might be seen as the intentional design of artificial biological systems, building on an understanding of natural biology. In others words synthetic biology is the design and construction of new biological parts, devices and systems that do not exist in the natural world and also the redesign of existing biological systems to perform specific tasks. Natural biological properties are used and transformed to build new systems.

18. Document DSTI/STP/BIO(2008)26 summarises progress with WPB work in this field and in particular the discussions had at the recent (Bellagio, Italy on 22-25 October 2008) planning meeting for the Symposium on Synthetic Biology to be held in April 2009. Amongst the issues raised were the safety and security dimensions of synthetic biology. What is fundamentally new about any of the processes or products emerging from synthetic biology and are existing regulatory structures in fact adequate to ensure their safety? Are there any codes of conduct or self regulatory mechanisms emerging? The meeting concluded that there is a need to discuss how future developments in governance frameworks might need to evolve to allow continued innovation whilst guaranteeing security. This will be a major theme in April and the outcomes of this discussion will need to be brought into WPB's thinking on biosecurity.

Joint CAS/IAP/OECD Workshop

19. The Secretariat was approached by the Chinese Academy of Sciences to co-organise a Workshop in Beijing (together with the Inter- Academy Panel) on aspects of biosecurity. This will take place on 8-9 December 2008. The draft Agenda for the Workshop is attached as Annex I. Besides staff from STI/BIO, the Director of OECD's International Futures Programme also will participate.

20. The workshop will be held under the auspices of OECD's Global Forum on the Knowledge-Based Economy (Biotechnology), which has provided the necessary financing. It is a clear example of WPB's commitment to the Council's priorities on Enhanced Engagement – in this case with China.

21. Several other opportunities to pursue similar workshops with non-members (including, for example, in Jordan) have had to be turned down due to limiting resources.

Actions: Delegates to WPB are invited to:

- Make **practical suggestions** about how the Guidelines might be better disseminated and promoted.
- **Consider** whether and how to keep WPB informed about progress in implementing Guidelines in Members as well as non-Members.
- **Note** the intention to discuss the biosecurity aspects of synthetic biology during the April 2009 symposium and **make suggestions** about how the outcomes of these considerations should be brought into WPB's workstream on biosecurity.
- **Note,** particularly in the context of Item 20 of the WPB Agenda, the support provided through the Global Forum on the Knowledge-Based Economy (Biotechnology) for the forthcoming CAS/IAP/OECD Workshop and **consider** whether and how future such events might best be financed (noting in particular the intention as articulated in the 2009-2010 PWB to hold such future round tables to promote WPB Guidelines).
- **Consider** sending delegates to the forthcoming workshop in Beijing on 8-9 December 2008.

Taking Work Forward in 2009-2010

22. The commitments and attendant resource needs for biosecurity work in the 2009-2010 PWB are set out in Table 1.

	Within Existing Resources (Part 1, EUR 15k per annum) *Output Result 3.5*	**With New Voluntary Contributions** (EUR 80k required per annum) *Output Result 3.6*
2009	Forum on Biosecurity	Analytical Report on Biosecurity
2010	Forum on Biosecurity	Analytical Report on Biosecurity (contd).

23. This needs some further context:

- The part 1 resources designated to providing a Forum on Biosecurity are all associated with Senior Management and not Analyst time. Thus they are resources set aside to oversee work rather than to perform it.
- The PWB commits WPB to producing one analytical report on biosecurity by the end of 2010 provided new VCs are made available. The focus and content of that report – as well as the methodology to produce it, and the minimum amount of VCs required to support such a methodology, are for WPB to determine.

- As envisaged, the activity on biosecurity is currently time-limited to the end of 2010. If WPB wished to continue work after that time such work would need to be included in the new PWB by consensus.

24. In fact, WPB has already discussed and decided which work to take forward, provided that VCs are forthcoming[3]. The options are not intended solely to be seen as mutually exclusive, though each would require new resources to take forward, at least within the current PWB.

25. The Summary Record of the 23rd session of the Working Party on Biotechnology (DSTI/STP/BIO/M(2008)2) notes (under agenda Item 9):

> "*The Secretariat (Mr. Gillespie) presented a paper on options for future work on Biosecurity. In discussion, delegates supported and agreed to option 2 set out in paper DSTI/STP/BIO(2007)29/REV1, namely "Considerations for the development of risk assessment methodologies". The United States signalled that they expected to be able to make a voluntary contribution in support of the work proposed, which envisaged a workshop in late 2009.*
>
> *Delegates agreed that a workshop should be held to address the issues detailed in option 2. It was also agreed that some of the aspects in option 3 in the paper – on "Guidance for risks associated with emerging bio-science and technology" – also should be considered during the workshop."*

26. As noted, document DSTI/STP/BIO(2007)29/REV1 describes the intended elements of work in some detail (reproduced in Annex II for ease of reference). In brief, two themes should be explored: the detailed development of risk assessment methodologies and; guidance for risks associated with emerging bio-science and technology:

(i) Considerations for the development of risk assessment methodologies

27. The focus of this element of work would be on taking stock of and analysing various risk assessment methodologies to draw out considerations for risk assessment of microorganisms for the purpose of securing them in laboratories. Consideration would be given to how to deal with the various uncertainties and challenges in developing solid biosecurity risk assessments as well as communication. The goal would be to point towards considerations for best practice. This would be a rather detailed and technical workstream but would have very practical outcomes intended to improve the quality of risk assessment and lighten the load on practitioners.

(ii) Guidance for risks associated with emerging bio-science and technology

28. This second stream is more forward looking and policy orientated and aims to avoid continued roadblocks being erected to the progress of science in our increasingly interconnected and globalised world. The goal would be to develop forward looking risk governance frameworks. The starting point would be to take stock of how such mechanisms are currently developed and what the essential principles underpinning the future governance of the life sciences could be.

[3] The US Delegation has previously indicated that they would like to make a voluntary contribution to support this work. The Secretariat needs as a matter of urgency to pursue this with the US authorities who are awaiting our input.

Going Forward

29. Substantive work cannot begin on these themes until voluntary contributions are in hand in the OECD, however WPB might wish to comment on the following Secretariat suggestions:

(i) Though the two themes share some **common background**, they will at some point have to be **phased** and treated as rather separate workstreams. However, this should not be done until the end outputs from the two streams are clarified.

(ii) The first substantive goal might be a **workshop that explores the two themes**, takes stock of the key requirements, and sets a plan of action for each theme that would need to articulate clearly the end points but, in practice, they are likely to be something like *Considerations For Best Practice in Biosecurity Risk Assessment* and *Principles for Governance of the Biosciences*.

(iii) A **steering group clearly will be required to oversee work** and some analytical research obviously will be required in advance of the workshop as well as any issues papers developed.

(iv) Provided VCs come through, a steering group could be held in the first few months of 2009 with a view to holding a **workshop around the end of 2009**. Soundings to date suggest that additional VCs would be required for work in 2010. Such a workshop would be held in Paris unless a host country is able to offer facilities.

(v) Such work may have greatest relevance if extended beyond the OECD Members. Consideration could be given to developing the **enhanced engagement aspects of this topic** as well as brigading it under the auspices of the OECD Global Forum on the Knowledge Economy.

Action: WPB delegates are invited to:

- **Discuss** and **comment** on the various suggestions made under paragraph 29.
- In particular, **indicate interest in joining an eventual steering group** for this stream of work.
- **Consider** whether they may be on a position to contribute **voluntary contributions** for 2009 or 2010.

Drawing the strands together

30. The WPB has a strong body of work behind it on biosecurity, however it appears fragmented given the piecemeal way it has been articulated. It contributed significantly to the Frascati workshop in 2004; it articulated international *Guidelines on Biosecurity for BRCs* and; it has held workshops on biosecurity and innovation in Moscow (2006) and (next month) in Beijing.

31. There may be significant added value in pulling these threads together in a single publication, perhaps entitled something like *Biosecurity and Innovation – Achieving a Virtuous Balance.* This might be a relatively short publication, simply pulling current material together and articulating the WPB vision as well as locus for work in this area. The work could be done quite quickly and within the resource envelope currently available (essentially drawing on the available senior management time allocated for 2009).

Action: WPB delegates are invited to:

- **Discuss** and **comment** on the suggested new publication.
- **Agree** how such work should be overseen by the WPB (or perhaps by the biosecurity steering group) if it goes forward.

ANNEX I

THE CAS/IAP/OECD JOINT WORKSHOP ON BIOSECURITY

7-9 December, 2008 Beijing, China

Workshop objectives

- Discuss and assess the misuse potential of new developments in life science research
- Understand how the risks of dual use research of concern are perceived in developed and developing countries
- Discuss oversight mechanisms for dual use research and how they can be balanced with the need to promote life science research
- Exchange views on managing dual use research through promoting the culture of responsibility
- Learn what can be done to unite various nations in a global effort to promote biosecurity

Agenda

Sunday, December 7

16:00-18:00 Registration
18:00-20:00 Reception

Monday, December 8

8:30-9:15 Session I: Introduction
8:30 Welcome
8:45 Opening Remarks
9:00 Introduction of participants
9:15 Photo and Break

10:00-12:00 Session II: Breakthroughs in Life Science Research and their Potential Misuse
Objectives of the session:
Topics:

- Dual use potential of life science research
- Actors involved
- Intentional vs. non-intentional misuse of research in the spectrum of biorisks
- New developments in life science research with potential risks of misuse
- Lessons learnt from previous developments in life sciences

12:00-13:30 *Lunch*

13:30-15:15 Group discussion

Questions:

- How do you define "dual use" research together with dual benefit research? How do you define dual use research that should cause concern?
- How do you define and evaluate dual use risks related to the new advances in life sciences?
- Are developed and developing countries equally concerned about the dual use issue? Is it an issue that should be dealt with globally?
- Are you concerned with the new developments in life sciences with respect to their potential use for malevolent purposes?
- How to address the dual use issues systemically? Is it necessary to address separately the dual use challenges of the emerging technologies from existing ones? What lessons can be learnt from existing approaches?

15:15-15:30 *Break*

15:30-17:00 Session III: Oversight of Research of Potential Misuse

Objectives of the session:

Topics:

- Whether and how dual use research of concern should be regulated? Formulating policies, regulations and legislations: Are there any examples of how the research with a dual use potential can be regulated? Are there any impact studies of such regulations on the delivery of innovation in life sciences? What are the gaps and how they can be filled in?
- Managing dual use research of concern
- Who should do what and how while managing life science research with the dual use potential? What is the role of governments, industry and research community?
  - Reviewing grant proposals
  - Reviewing communications
- Reducing risks of misuse while promoting life science research

17:00-18:00 Group discussion

- Do you think that certain control mechanisms are needed to safeguard against the misuse of life science research?
- How can the need for advancing life science research be balanced with that for safeguarding against misuse of the research?
- How can dual use research of concern be regulated?
- To what extent should dual use research of concern be regulated globally?
- How should international cooperation in scientific research be promoted while dual use research of concerned managed properly?
- What is the role of international bodies in reducing the duplication of efforts and harmonization of approaches for managing the dual use risks?

Tuesday, December 9

8:30-10:30 Session IV: Culture of Responsibility
Objectives of the session:
Topics:
- Raising awareness through education and training
- Code of conduct, ethical framework

10:30-10:45 *Break*

10:45-12:00 Discussion
Topics:
- What is the current level of awareness of the misuse potential of life science research?
- How can awareness be raised through education and training"
- What are the best approaches for promoting culture of responsibility?
- How important are codes of conduct in promoting culture of responsibility and reducing the risks of misuse of life science research?
- What are the principles that should be included in codes of conduct?
- Is the code of conducts suffice to reduce the risks of the dual use research in life sciences?

12:00-13:30 *Lunch*

13:30-14:30 Session V: Summary
Reports from each of the discussion groups

14:30-14:45 Closing remarks

14:45 Adjourn

ANNEX II

VERBATIM EXCERPT FROM DSTI/STP/BIO(2007)29/REV1

"Considerations for the development of risk assessment methodologies

At present, the only known, internationally agreed upon framework for classifying biological materials according to biosecurity risk levels is published in "*OECD Best Practice Guidelines on Biosecurity for BRCs*".

Consultations so far with culture collections implementing these Guidelines suggest that though the framework is helpful, a number of key difficulties remain. These include uncertainties about:

- The assumptions and background to currently existing risk assessments (for example, used in export control regimes)[4]. The Best Practices encourage that risk assessment and subsequent management should draw on such existing classifications and assessments, but the means why which this could be done remains to be articulated;
- A number of key variables used in subsequent risk assessment, for example, information about the ubiquity of the skills and knowledge needed to use the material in a bio-weapon or availability of countermeasures against such material;
- How to take account of strain, economic or geographical differences in determining local biosecurity risks associated with certain pathogens in different locations;
- How to weigh up considerations about likelihood that biological materials are able not just to cause disease in humans, animals or plants, but also have the capacity for affecting public health and medical infrastructures on a large scale;
- How to integrate biosecurity with biosafety risk assessments when determining appropriate management regimes. There is common agreement that such integration needs to be done, but the exact modalities and limits of doing so – both at the scientific and the technical management levels – remain open to much uncertainty;
- How to share and organise work on risk assessment in such a way that economies of effort in different institutes are captured. A balance needs to be struck between disclosing information that could in itself have implications for security and the development of common approaches, datasets, and assessments, as well as databases, networks and cooperative approaches that might be available to the scientific community; and,

4. Almost every OECD Member country participates in at least one multilateral import/ export control regime for dangerous pathogens/ biological agents and dual use equipment. List based approaches to risk assessment are used for this purpose, however they do not classify materials and equipment as posing more or less risk, thus they do not lend themselves to graded (and thus more efficient and proportionate) security measures in the context of securing laboratory facilities

- How to ensure that responsible risk assessment and management delivers on public and policy confidence (for example, through community engagement and/or risk communication.

The OECD and the Working Party on Biotechnology have significant expertise and experience relating to biological risk assessment. They are thus in a position to develop and diffuse a reproducible tool throughout the bioscience community for more comparable risk assessment for biosecurity.

This work option could:

- Take stock of and analyse various risk assessment methodologies (see, for example, Annex III) to draw out considerations for risk assessment of microorganisms for the purpose of securing them in laboratories.

- Consider how to take account of strain, economic or geographical differences in determining local biosecurity risks associated with certain pathogens in different locations (broadly similar issues have been under debate, including in the OECD, related to, for example, the risk assessment of living modified microorganisms that might escape or be released into the environment).

- Consider the key priority issues for convergence of biosecurity and biosafety assessments.

- Explore options for sharing of the broader of risk assessments across countries.

- Consider current thinking on best practices for risk communication in this field.

This work option builds on and strengthens the analytical and policy work already done. Consultations with the potential user community for a risk assessment tool (primarily those working in culture collections) suggests that there is a real demand. But practitioners alone cannot take the necessary steps to develop such a tool – some policy input also is required. **There has also been interest noted in this work package amongst the policy community in a number of countries.**

[…….]

Guidance for risks associated with emerging bio-science and technology

Rapid advances in science and technology will continue to present a constant challenge to policymakers who create framework conditions for responsible delivery of innovation. This raises a key question about how the science community can help ensure that additional barriers to the dual use of such innovations do not simply keep growing at a rate equivalent to scientific advance.

For example, the sequence information that defines the genomes encoding for Ebola virus, smallpox and 1918 influenza virus is readily available online. DNA synthesis might potentially be used to obtain the genetic material encoding these pathogens. Although additional expertise would be needed to produce a bioweapon, such work might not be subject to oversight by current regulatory frameworks.

Time is not on the side of policymakers who seek to improve pathogen security as access to such technology improves and comes down in price. Since 2000 the market price for gene length DNA synthesis

has fallen from US $10 to US $1, and oligonucleotide costs have fallen to US $.20 per nucleotide in the last decade with commercial providers delivering them in less than 48 hours.[5]

Policymakers also need to take account of risks associated with the integration and synergy of biotechnology with advances in disciplines such as materials science, nanotechnology and information technology. Technology convergence principally is driven by the potential to improve public health, agriculture and strengthen national economies, but many experts believe it naïve to think that any source of extraordinary growth in the life sciences might not be exploited for destructive purposes.[6]

Global dispersion of life sciences knowledge and technological expertise imply that such advances warrant an international policy discussion about a broader spectrum of risks emanating from the life sciences than has previously been considered and how to ensure that future governance does not turn off the innovation tap. WPB could take the lead in the development of forward looking risk governance frameworks by:

i) Developing tools to anticipate, identify and mitigate these dangers. Rather than surveying the latest trends to produce a list of threats, the aim might be to describe a process and set of organizing principles by which risks associated with the malevolent use of technological advances might be managed.

ii) Examining how the diverse communities involved in biotechnological integration could best share information to identify and serve notice of risks at the earliest possible stage of development.

This work option takes a much more forward-looking perspective that aims to avoid continued roadblocks being erected to the progress of science in our increasingly interconnected and globalised world. This is the work option that has so far attracted greatest interest amongst WPB delegates.

If there is interest in taking this work forward, a small meeting of interested parties is probably called for – this could be done in the first instance by teleconference to the extent possible. The goal of such a meeting/ process would be to bring a worked up programme back to the WPB, preferably over the summer period, on precisely what could be done (and in particular how this would sit with work on synthetic biology). **WPB delegates would have to signal interest in such work at the forthcoming meeting (and perhaps assign new voluntary contributions) for any action to be taken forward.**"

5. H. Bugl, J. Danner, R. Molinari, J. Mulligan, H. Park, B. Reichert, D. Roth, R. Wagner, B. Budowle, R. Scripp, J. Smith, S. Steele, G. Church and D. Endy, "DNA Synthesis and Biological Security", Nature Biotechnology, Vol. 25, No. 6, June 2007.

6. Committee on Advances in Technology and the Prevention of Their Application to Next Generation Biowarfare Threats National Academy of Sciences, "Globalization, Biosecurity and the Future of the Life Sciences", National Academies Press (2006).