Sensitive Technologies: The Tertiary Sector's Responsibilities[1]

Prepared jointly by DFAT, ASNO, Defence and PM&C

1. CONTEXT FOR CONCERN

1.1 Introduction

The changed security environment in recent years has clear implications for Australia's tertiary and research institutions. The Australian Government is working to increase awareness of the need to counter the spread and misuse of advanced technologies and materials which could contribute to a program to develop weapons of mass destruction[2] (WMD). All Australians should share responsibility to prevent such misuse.

The notion of academic freedom continues to be fundamental to the advancement of science. However, the academic research environment offers state and non-state actors (organisations and persons) a significant range of opportunities, which could be exploited to help them develop chemical, biological, radiological and nuclear (CBRN) weapons. This includes access to scientific knowledge and expertise, reagents and equipment, agent research and production know-how, as well as knowledge available through publications and conferences.

Although both state and non-state actors view the academic research environment as a means to advance their purposes, the threats posed by these groups are distinctly different. The degree of concern is driven by the level of sophistication, the capability, resources and intent of each group. In turn, this can impact on the type and level of expertise they may seek to exploit, the types of materials, reagents and agents they may try to acquire, the level of sophistication in scientific methodology they may attempt to master, and the publications and conferences they may target.

1.2 Non-State Actors (Terrorists)

Although the use of explosives remains a non-state (i.e. terrorist) choice of weapon, some terrorist groups such as al-Qai'da and associates, have had a long-term interest in CBRN weapons. The sarin gas attacks in the Tokyo subway and anthrax letter attacks in the United States underline a history of terrorist interest in acquiring and using CBRN. There are indications that al-Qai'da and associates have recognised and respect scientific expertise as a means by which they may successfully develop CBRN weapons. There have also been indications of their attempt to utilise chemical, biological and radiological (CBR) materials.

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[1] This paper is a revised version of the paper presented at the Australian Vice-Chancellors' Committee, Deputy and Pro-Vice-Chancellors (Research) Meeting, Wollongong, 28 July 06.

[2] Weapons of mass destruction refer to chemical, biological, radiological and nuclear weapons and their delivery systems. The risk of terrorists accessing and using nuclear weapons is remote.

At this stage it appears the level of sophistication surrounding their CBR efforts has been limited, involving interest in crude recipes for biological and chemical agents such as anthrax, botulinum toxin, ricin and cyanide. It is therefore more likely terrorist groups would be satisfied with a lower level of education and experience than would state efforts; may attempt to acquire relatively unsophisticated agents and equipment that would be ready to use and not require further manipulation or development; and are less likely to target scientific publications and conferences describing complicated methodology to develop agents.

1.3 State actors

By placing students and researchers in overseas universities and other research institutions, countries of WMD concern may seek to significantly accelerate their WMD capability through the acquisition of knowledge about another countries' earlier breakthrough research, and through awareness of and possibly participation in cutting edge research activity in countries such as Australia. Academics in relevant areas may also be cultivated as possible sources. Areas of interest would include subjects with knowledge and technology that could be used to support WMD programs. While the most potent knowledge is gained through postgraduate studies, the ability to exploit access through undergraduate courses cannot be dismissed.

2. RESEARCH COMPONENTS OF POSSIBLE CONCERN

The possibility that research and associated technologies and equipment might be misused by state and non-state actors to advance illegal weapons programs is an inherent risk for the science and technology sector. Some in the sector, such as nuclear physicists, are familiar with the "dual-use" implications of their work and are relatively accustomed to a regulatory environment that seeks to enhance security and limit the proliferation of nuclear weapons and related technology or knowledge. Others may be less familiar with the potential security implications of their research. The following paragraphs outline briefly the components of research that may pose a dual-use concern and which are thus vulnerable to exploitation.

2.1 People

Staff and students working in the education sector may have access to technology, equipment, samples, data and "knowledge" which, if used inappropriately, could pose security threats. Particular concerns relate to disaffected individuals. Sound recruitment and human resource management practices are needed to reduce the possibility of disgruntled employees using knowledge and facilities or equipment with malicious intent. Students and visitors who may only require access and information for short periods may be of concern, including because there may be relatively little information regarding their previous work history and practices and yet the rationale for their access to the facility is often to acquire knowledge and expertise of particular techniques or equipment.

2.2 Reagents, materials, biological agents and equipment

These are fundamental to research, but certain types of items may pose a "dual-use" concern. For example, glass-lined reactor vessels are important

in many areas of chemical research and in the chemical industry, but the same equipment is also of chemical weapons (CW) proliferation concern because the highly corrosive nature of many CW precursors requires such vessels for CW production. Regarding equipment used in the biological sciences, biosafety cabinets are an occupational health and safety necessity in some facilities, to prevent infection during legitimate and beneficial research on pathogenic organisms. These cabinets also would be necessary to handle some pathogens whose culturing may be intended to cause a deliberate disease outbreak.

2.3 Samples

Ready access to samples and specimens is fundamental to efficient research and, like some equipment, certain specimens are of security concern. Because of the relative ease with which biological specimens can be grown rapidly into large volumes and either used to infect the population or used to produce biologically-derived toxins, key biological samples (agents) pose particular security concerns. High risk agent or toxins of security concern include, but are not limited to, *Bacillus anthracis* (the causal agent of anthrax), *Yersinia pestis* (plague), ricin (derived from castor bean plants) and botulinum toxin (produced by *Clostridium botulinum*).

2.4 Know-how

Tangible items such as equipment and samples pose a clear dual-use risk and can be controlled relatively easily to limit the likelihood of their contributing to weapons proliferation or terrorist capability. By contrast, intangible items such as "knowledge" may also pose security concerns, particularly if critical knowledge or technical detail is communicated widely through, for example, publication in scientific journals, emails, the internet or at conferences. The challenge of managing the dual-use dilemma posed by such intangible technologies is enormous and underlines the importance of raising awareness among scientists, technologists and engineers of the possible security implications of their work, and the need to ensure that their activities do not contribute, even inadvertently, to the threat posed by weapons proliferation or the interest of terrorists in acquiring and using WMD.

2.5 Publication

Historically, information sharing in most areas of research has been almost completely open with the exceptions of nuclear and defence science where research is often "born classified", and more recently where commercial constraints apply. The notion of academic freedom continues to be fundamental to the advancement of science but needs to be weighed with great care and sensitivity against security concerns that might suggest limitations on the openness of dissemination. Security sensitive research may arise in tertiary institutions when addressing issues:

- of interest to the Department of Defence;
- of interest to other security agencies (e.g. police, fire, health, intelligence, emergency services, foreign affairs, transport, etc); and

- that might have dual-use applications (beneficent and maleficent).

The current security environment is dramatically different to that of even a few years ago. Now research findings are being studied for application by those with malicious intent. Consequently, research institutions unfamiliar in dealing with the security implications of their activities may now need to consider security issues when advising on the appropriateness of certain research and its dissemination.

Academics and researchers need to be aware of the possible security implications of their work and discoveries. They must be alert to the possibility that it could advance programs of concern being pursued by state and non-state actors. With this in mind, individually and organisationally, they need to work with governments to ensure the risk is minimised. Governments will need to establish sound awareness raising programs. Researchers will need to consider security issues from the conceptual stage of work programs—and keep it under periodic review, since initial objectives may change as the research progresses. Further, researchers could consider sharing the findings of their work with government before publishing to manage the risk of the proliferation of critical knowledge.

3 MANAGING THE COMPONENTS OF RISK

The previous section has outlined the components of the research endeavour of possible security concern. There is some level of risk attached to each of these components being misused or compromised by those with malicious intent, be they acting on behalf of foreign governments, sub-national groups or as individuals. It is not possible to eliminate the security risk associated with vital advancement of knowledge. However, it is important to take all reasonable and necessary steps to seek to manage the risks. This may include the introduction of additional security considerations in, for example, Codes of Conduct. It may require, also, establishment of institutional review processes for security sensitive research that may involve representatives from the security community, or promotion of awareness of security concerns to allow researchers to act in an informed and responsible manner.

The risks posed by state and non-state actors are addressed by both regulatory and non-regulatory monitoring mechanisms. Regulatory mechanisms include the assessment of students and scholar applicants at the point of visa application (or extension), with the option of visa denial, and processes to monitor and prevent any changes of concern in the characteristics of the study being undertaken during the student or scholar's visa term. Commencement of potential divertible study by spouses is also subject to enhanced scrutiny. Non-regulatory mechanisms include awareness-raising presentations to Australian academics and administrators. Persons with terrorist profiles that have expressed interest in CBRN are addressed through terrorist screening processes.

3.1 People

A fundamental tenet of security is that only those with a need to know and for whom satisfactory background security checks have been conducted

should be given access to sensitive materials, information and equipment. This principle has guided, *inter alia,* the Council of Australian Government (COAG) review of hazardous materials.[3] While recognising that many materials are carefully controlled for a variety of reasons—not necessarily for reasons of security—the Review has developed, nonetheless, lists of materials that should be controlled and made recommendations regarding the level of security that should be applied to these items. Further, the reports have made recommendations about background security checks that should be conducted in controlling access. These recommendations seek to be practical and are risk-based, recognising that it is not possible to control every item with the same high level of security. The reports on biological agents and radiological materials have been issued for public consultation. The report on hazardous chemicals is due to be similarly released shortly.

Nonetheless, the basic principle is that researchers who have an appropriate awareness of security sensitivities and the security environment will act in a responsible and appropriate manner. Awareness-raising is critical to managing the residual security risks surrounding researchers engaged in security sensitive activities. Researchers can also assist the security community by reporting suspicious approaches or activities to the National Security Hotline as this has been of great assistance in disrupting criminal activity in the past.

3.2 Export Controls

Export controls are an increasingly important responsibility of government. International concern has grown over the proliferation of WMD and advanced conventional weapons, as well as the interest that terrorist groups have shown in these items.

In 2004 the United Nations Security Council passed a binding Resolution 1540, which obliges all states to refrain from supporting by any means, the proliferation of WMD or their delivery systems, and related materials, particularly by non-state actors. More specifically, Resolution 1540 requires all states to enforce appropriate criminal or civil penalties for violations of relevant export control laws and regulations and to report to a Security Council Committee on the actions that have been taken to implement it.

Although Australia is geographically remote from many of the chronic areas of instability and proliferation concern that the media presents on an almost daily basis, Australia is not immune from the attentions of proliferation networks.

Australia's economy is part of a global trading system and its security is directly enhanced when robust controls over exports are enacted. This contributes to minimising the risk of proliferation or the provision of even inadvertent assistance to terrorist groups

[3] In response to world terrorist activities, the COAG commissioned the Department of Prime Minister and Cabinet to conduct an extensive review of domestic controls of hazardous materials in late 2002. The COAG review is still ongoing and separately covers toxic/explosive chemicals, harmful biological agents and radiological material.

The Australian Government takes its responsibilities of international citizenship seriously. Australia is a party to all of the major international non-proliferation treaties and export control regimes,[4] some of which will be discussed in this paper. The non-proliferation treaties include the Chemical Weapons Convention (CWC), the Biological Weapons Convention and the Treaty on the Non-Proliferation of Nuclear Weapons. Export control regimes include the Australia Group (AG), the Nuclear Suppliers Group, the Missile Technology Control Regime, the Zangger Committee and the Wassenaar Arrangement. Most other comparable countries, who are also Australia's competitors in commercial terms, belong to the same regimes.

Countries in Australia's region have export controls of varying effectiveness. Some are unwilling hosts for terrorist groups. Australia strongly supports continuing efforts to increase adherence to export control standards as widely as possible.

3.2.1 Defence Trade Control and Compliance (DTCC)

The Department of Defence has the responsibility for regulating the export of defence and related goods and technologies designed or adapted for military use or goods that are inherently lethal, as well as goods that have a dual use that can be adapted for military use or in WMD programs. This responsibility is exercised by the Defence Trade Control and Compliance (DTCC) Section under the *Customs Act 1901*—Customs (Prohibited Exports) Regulation 1958—Regulation 13E and the *Weapons of Mass Destruction Act 1995*. Regulation 13E enables the Australian Government to control the export of certain items identified in a schedule of the regulations known as the Defence and Strategic Goods List (DSGL).

The DSGL is a consolidated, comprehensive listing of a wide range of defence and dual-use goods and technologies that has been developed through the various international export control regimes and non-proliferation treaties and conventions. It is regularly updated to ensure that it remains current and reflects advances in technology. The DSGL includes military and dual-use equipment (goods made for a commercial purpose but can also be used in a military or weapons program), nuclear material, chemicals and toxins, human, plant and animal pathogens, electronics, software and related technology. The legislation also includes enforcement provisions with adequate sanctions to deter non-compliance.

3.2.2 Weapons of Mass Destruction Act

Within the international community many have expressed concern that the flow of information has the capacity to increase insecurity by strengthening the capability of terrorist organisations. In the last two decades new communication technologies have provided previously unimaginable access to a myriad of information. This information not only has the potential to provide terrorists and states of proliferation concern with access to

[4] Further information on these treaties and regimes is provided in the Government's paper "Weapons of Mass Destruction: Australia's Role in Fighting Proliferation - Practical Responses to New Challenges" released in October 2005. Copies are available from the DFAT website at http://www.dfat.gov.au/publications/publications.html.

extremely sensitive information, but provides the infrastructure to share this information. For example, a Google search of 'how to build a nuclear bomb' returns 13,200 hits and 'how to create chemical or biological weapons' returns 161 and 57 hits respectively.

It is not possible to identify and describe for regulatory purposes all goods and services which could contribute to a WMD program. To address this situation, the Australian Government introduced the *Weapons of Mass Destruction (Prevention of Proliferation) Act* (WMD Act) in 1995. The WMD Act and the associated regulations aim to prevent Australian assistance being given to programs for the development of WMD and enable the Government to control the export or transfer of any goods and services that may assist a WMD program, including those not listed in the DSGL.

The WMD Act defines a WMD program as a "plan or program for the development, production, acquisition or stockpiling of nuclear, biological or chemical weapons or missiles capable of delivering such weapons". The WMD Act applies to:

- the supply of tangible goods or services, or to the intangible transfer of technology;
- the export of goods and technologies that are not controlled under other legislation and where it is known or suspected that the goods may be used in a WMD program;
- the provision of goods and services within and external to Australia, where it is known or suspected that they will or may potentially assist a WMD program; and
- the actions of Australian citizens, permanent residents and incorporated bodies both within and outside of Australia.

Control over the supply of goods is straightforward and includes non-listed items i.e. those not covered by the DSGL. Supplying services is considered to include both the tangible and intangible supply of technical assistance by way of know-how and technology, financial assistance or brokering the supply of such goods or services.

Intangible Technology Transfer. Of specific interest here is the issue of the intangible transfer of technology (ITT). ITT involves the use of voice (face-to-face), telephone, fax, e-mail, internet or any other means for transferring technology or know-how that does not involve a tangible medium (like paper, CD, tape, drawings, etc). By placing information on the Internet, or by presenting a paper to an international forum, or indeed showing someone how to put some item together, the technology is considered to have been made available to foreign persons or entities because it is in the public domain – the owner of the information no longer has control of it. ITT also includes tuition as this is a form of presentation or a transfer of know-how; it involves providing the information to students by voice or visual aids but not tangible means such as paper.

The WMD Act imposes substantial criminal penalties for breaching the prohibitions on the supply of tangible and intangible goods and services that

may contribute to a WMD program. This catch-all legislation is now part of export control arrangements in an increasing number of countries.

In the United States, ITT is controlled by a "deemed export" concept where you must apply for a licence before even speaking to a foreign national on any controlled technology. The United States also has in place a comprehensive offences and penalty regime to support its legal obligations. Other countries also cover ITT, although with differing approaches to ensuring compliance.

In Australia, the WMD Act places specific obligations on companies and individuals involved in the trade of goods or provision of services to ensure that these are not destined for use in a WMD program. Providers of goods and services should exercise prudence in any transaction. The onus is placed on the exporter or service provider to make reasonable enquiries in relation to how the products, information and know-how will be used and by whom.

There is a mechanism for seeking information about the applicability of this Act or for seeking permission to conduct specific activities. Section 12 of the WMD Act allows a person to seek information from the Minister before going ahead with the activity. The Minister will reply with a considered response, involving advice from other areas of government if necessary, and advise the applicant whether or not there is a concern. This is a particularly useful option when the applicant is unsure of whether the technology at issue might be relevant to WMD or whether the end-user of the technology might be of concern.

Applicants may apply for a permit in writing under Section 13 of the WMD Act, to supply or export goods or services, including intangible transfer of technology. After consideration, DTCC would either issue a permission to conduct the activity or would advise the Minister to deny an application. Only the Minister for Defence can deny applications under Section 14 of the Act.

The WMD Act binds Australian citizens and persons normally resident in Australia, as well as foreigners doing business in Australia. It also binds bodies incorporated in Australia or an external Territory whether doing business in Australia or overseas. Corporate bodies are deemed to have the state of mind of their directors, servants or agents if acting within the scope of their actual or apparent authority.

It should be noted that under Section 15 of the WMD Act, corporations may be liable under some circumstances for the activities of their staff.

Inasmuch as Vice Chancellors are responsible for the management of the affairs and exercise control over university policy and in administrative matters, they can help to ensure compliance with the WMD Act by taking reasonable precautions and exercising due diligence in this matter. Such precautions could include:

- explicit reflection of these obligations in University policy; and

- advice to staff on this legislation and their requirement to adhere to University policy on the matter.

ITT is one of our greatest concerns. It is difficult to control and enforce, and requires considerable cooperation between the exporter/agency and government.

3.2.3 Export to a sensitive destination

When controlling exports, consideration is given not only to the item concerned but the destination as well. Each controlled export is considered on its own merits in the light of circumstances prevailing at the time of the export request.

3.2.4 Strengthening Export Controls

To ensure that Australian export controls are current and effective, DTCC commissioned a benchmarking study to compare Australia's export control system with that of other like-minded countries, namely, Canada, the United Kingdom, Switzerland, Netherlands and the United States.

The benchmarking study provided Defence with a comparative analysis of resources, licensing processes and legislative controls, which have been used as a strategic planning tool for strengthening the short and medium-term administration of Australian export controls.

DTCC also conducts regular outreach activities (such as visits, publications etc) to stakeholders in Australia in a cooperative effort to assist all exporters and relevant agencies to comply with legislation. DTCC will further develop these activities.

All these actions are planned to raise the performance of Australia's export control system to the best practices standard of like-minded countries. Australia has always enjoyed a good reputation as a responsible and trusted exporter – but the changes in our security environment and the advance of technology requires it to keep up-to-date.

3.3 WMD Scenarios

3.3.1 Supply of Education Services

An overseas student is studying medical cloning techniques at an Australian university. This type of research is applicable to a biological weapons program. It becomes apparent to the university that the student is regularly sending information to the defence ministry of her home country.

The university should seek guidance from the Minister for Defence, through DTCC, because the unauthorised supply of an education service under the suspicion or belief that it may assist a WMD program is a criminal offence. The Minister for Foreign Affairs may also determine that the student's presence in Australia may be associated with the proliferation of WMD, with the consequence that the student's visa may be withdrawn.

3.3.2 Export of Sensitive Dual-use Equipment

An Australian manufacturer receives an order from an overseas entity for a milling machine. The exportation of milling machines above a certain specification is subject to control.

The manufacturer must apply for authorisation to export if the specifications of the milling machine make it subject to control under the DSGL. If unsure about whether or not the equipment fits such specifications, the manufacturer should seek advice from DTCC.

There has also been a case where a sensitive instrument was exported and it became necessary for the Australian Government to intervene due to the end user of this instrument misusing it in contravention of a certified end use agreement they had signed. To prevent further misuse, the Australian Government requested that the Australian supplier withhold further technical support in the form of spare parts and technical information.

The bottom line is—if in doubt check. DTCC provides advice as required to assist all exporters to comply with their obligations and is able to check on end users, and the proposed end use as well as assess whether a good or technology is controlled or of concern. The advice is a free service.

3.4 Controlled Materials

Lists of items controlled internationally through export and import regulations have been consolidated into the DGSL.[5] The DGSL addresses only the matter of export control and the international transfers of tangible goods, while the WMD Act applies to intangible transfers of WMD-related technology. WMD related materials and goods form only part of the DGSL.

The DSGL also covers the AG lists and all the chemicals derived from the CWC Schedules. Regulation 5J of Customs (Prohibited Imports) Regulations requires permits to be issued from The Australian Safeguards and Non-Proliferation Office[6] (ASNO) for the import of these chemicals. Further information about controlled chemicals for both import and export is available on DTCC's CD ROM.[7]

3.4.1 The Australia Group

Participating Governments in the AG aim to ensure that exports from their countries do not contribute to the development of chemical or biological weapons. They do this by licensing the export of certain chemicals,

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[5] The DGSL may be found at http://www.defence.gov.au/strategy/dtcc/publications/PG14.pdf.

[6] ASNO is responsible for, among other things, implementation of a number of international WMD-relevant treaties including the CWC, the Comprehensive Nuclear Test-Ban Treaty and the Nuclear Non-Proliferation Treaty. ASNO annual reports are available from its website at http://www.asno.dfat.gov.au.

[7] "International Chemical Trade Control: Information for Australian Importers and Exporters of Chemicals" Version 2.0, October 2004. Available from DTCC (http://www.defence.gov.au/strategy/dtcc/publications.htm) or ASNO (http://www.dfat.gov.au/cwco).

biological agents, and dual-use chemical and biological manufacturing equipment which can be used in chemical or biological weapons programs.

The AG lists about 100 biological agents[8] and equipment for the manufacture of biological agents.[9] Similarly, the AG controls chemicals[10] and equipment for the production or manufacture of chemicals.[11] The export of all these items is controlled by DTCC to limit the (potentially inadvertent) proliferation of chemical and biological weapons.

3.4.2 The Chemical Weapons Convention

The main goal of the CWC is to eliminate an entire class of weapon of mass destruction. At the same time, the Convention also has provisions to ensure that no new chemical weapons emerge. Agents that may be used in chemical weapons or as feedstocks to make new toxic agents can be derived from the chemical industry or other research institutions which are involved in legitimate activities. To ensure that such chemicals are not being diverted for prohibited purposes, and for transparency to the international community, the Convention requires declarations and inspections at declared facilities.

The three Schedules of chemicals listed under the Convention, some of which are also included under the AG chemical lists, are either toxic chemical warfare agents, such as sarin and sulphur mustard, or precursors to these agents, such as some organophosphorus compounds (including diethyl ethyl phosphonate) which may be used as nerve agent precursors. Other common dual-use chemicals include thiodiglycol, thionyl chloride and triethanolamine.

There are currently 178 member countries to the Convention. States Party to the CWC are not permitted to supply Schedule 1 and 2 chemicals to non-States Parties because there is no verification of the end-use of these chemicals and consequently no reassurance that they are not being diverted for covert purposes.

The Chemical Weapons (Prohibition) Act 1994 and its regulations ensure that activities with CWC-Scheduled chemicals are regulated and assist Australia to meet its obligations under the Convention. For example, the Act requires permits for production of CWC-Scheduled chemicals generally above certain threshold quantities. Of most relevance to researchers, is the requirement for a permit to produce any quantity (up to a limit) of Schedule 1 chemicals.

Such activities are only permitted for research, medical or pharmaceutical purposes. Further information is available from an ASNO publication.[12]

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[8] http://www.australiagroup.net/en/agcomcon.htm
[9] http://www.australiagroup.net/en/control_list/bio_equip.htm
[10] http://www.australiagroup.net/en/agcomcon.htm
[11] http://www.australiagroup.net/en/control_list/dual_chemicals.htm
[12] "The Chemical Weapons Convention: A Guide for Australian Industry Producing, Using or Trading Chemicals", June 2004. Copies of ASNO CWC-relevant publications are available at http://www.dfat.gov.au/cwco.

3.4.3 COAG

The chemical, biological and radiological COAG reports, dealing directly with domestic concerns, cover different ground. COAG seeks to ensure that all 'sensitive' items are accounted for, handled and secured appropriately. Further, it seeks to ensure that only people with an appropriate security clearance are given access to these sensitive items. Thus the reviews foreshadow the possibility of developing dedicated security regulation for facilities that handle these and other highly hazardous materials. The COAG reviews have made recommendations based on risk, availability and intelligence and developed lists of items which should be regulated.

The COAG reviews have proposed domestic control lists for chemicals, biological agents and radiological materials[13]—the last two of which are attached at Annexes A and B. The chemicals list is not included in the Annex since, at the time of writing, it has not been released for industry consultations. Like their international equivalents, these lists will be kept under regular review to ensure they are up-to-date and manage the risk appropriately.

3.5 Publications: Code of Conduct

In the event that research has produced security-sensitive results, the author and institution needs to consider the appropriate actions with regard to publication or otherwise disseminating these results. Apart from limitations pertaining to export control, Australia does not have domestic regulations or legislation covering dissemination of security sensitive research findings and relies heavily on the responsible actions of the researchers and institutions.

In the US, this issue has been addressed by various publications from the National Academy of Sciences and is managed by;

- peer review processes within the scientific community or research institutions;
- scientific journals exercising their judgment on the suitability of articles for publication; and
- the establishment of the National Science Advisory Board on Biosecurity consisting of eminent individuals charged to advise on national policies regarding dual-use research, balance the need for scientific progress and security, and enhance the culture of responsibility among life scientists.

The joint AVCC, ARC and NHMRC review of the *Statement and Guidelines on Research Practice*, now known as the draft *Australian Code for the Responsible Conduct of Research – February 2006* is to be applauded as a useful step in the direction of facilitating peer review of researcher's conduct, including publication. The draft Code could be enhanced to more completely reflect the security considerations outlined in this paper. To this end, the Department of Foreign Affairs and Trade made a formal submission

[13] COAG also addressed ammonium nitrate, but that is not of concern here.

to the review working group, including suggestions for specific sections of the draft Code that could be strengthened in this way.

4.1 Summary

Clearly the acquisition of technology, know-how, reagents and agents by suspicious or unverified state and non-state actors is of considerable concern to Governments and runs counter to Australia's national interest. Without a doubt, tertiary and research institutions are on the front line in helping to prevent the proliferation of WMD sensitive items and information. Prevention is a joint effort between these institutions and Government. Concerned Government agencies recognise the need to consult in order to find optimal ways of managing the balance between the acknowledged need for academic autonomy and the control of information, materials and people. Special consideration must also be given to the application of extra-territorial provisions of the WMD Act as it applies to Australians involved in off-shore research programs.

Proposed COAG List of Biological Agents

Tier 1 Agents (12 agents)

- Abrin
- *Bacillus anthracis* (Anthrax - virulent forms)
- Botulinum toxin
- Ebola
- Foot and mouth disease virus
- Highly pathogenic influenza virus, infecting humans (such as 1918 pandemic influenza virus and H5N1)
- Marburg virus
- Ricin
- Rinderpest
- SARS coronavirus
- Variola (Smallpox)
- *Yersinia pestis* (Plague)

Tier 2 Agents (10 agents)

- African swine fever
- Capripox virus (Sheep pox virus and goat pox virus)
- Classical swine fever virus
- *Clostridium botulinum* (Botulism; toxin-producing strains)
- *Francisella tularensis* (Tularemia)
- Lumpy skin disease virus
- Peste des petits ruminants virus
- *Salmonella Typhi* (Typhoid)
- *Vibrio cholerae* (Cholera) (strains 01 and 0139 only)
- Yellow fever virus (non-vaccine strains)

Annex B1

List of Radiological Sources typically used in Australia

Category	Practice	Isotope	Activity	Chem/Phy properties
Category 1	Sterilisation	Co60	0.1-400 PBq	Metal
		Cs137	0.1-400 PBq	Ceramic or Powder
	Teletherapy	Co60	50-1000 TBq	Metal
		Cs137	500 TBq	Ceramic or Powder
	Radioisotope Thermoelectric Generators	Sr 90	PBq	Foil
	Agricultural seed irradiator	Co 60	1-1000 TBq	Metal
	Blood Irradiator	Cs137	2-100 TBq	Ceramic or Powder
Category 2	Industrial radiography	Ir192	0.1-5 TBq	Metal
		Co 60	0.1-5 TBq	Metal
	HDR/MDR Brachytherapy	Ra 226	30-300 MBq	Powder
		Co 60	0.1-10 GBq	Metal
		Ir 192	400 GBq	Metal
		Cs137	0.1-500MBq	Ceramic or Powder
Category 3	Bore-Hole Loggers	Cs137	1-100 GBq	Ceramic or Powder
		Am 241/Be	1-800 GBq	Powder
		Cf 252	50 GBq	Ceramic
	Level/Thickness/ Density gauges	Cs137	0.1-1TBq	Ceramic or Powder
		Co 60	1-10 GBq	Metal
		Am 241	4 GBq	Ceramic
Category 4	Moisture/ Density gauges	Am 241/Be	0.1-2 GBq	Powder
		Cs137	400MBq	Ceramic or Powder
		Ra226/Be	1.5GBq	Powder
		Cf 252	3GBq	Ceramic
	Level/Density gauges	Cs137	0.1-40 GBq	Ceramic or Powder
		Co60	0.1-1 GBq	Metal
	Thickness Gauge	Kr85	0.1-50 GBq	Gas
		Am 241	1-10 GBq	Ceramic
		Sr 90	0.1-4 GBq	Ceramic or Powder
		Tl 204	40 GBq	Ceramic
Category 5	Those not in Category 1,2,3,4	Various	Up to 100 MBq	Ceramic or Powder

Nuclear Material

Nuclear material specifically refers to plutonium, uranium and thorium. This definition originates from Article XX of the *International Atomic Energy Agency (IAEA) Statute* and is established in Australia through the *Nuclear Non-Proliferation (Safeguards) Act 1987* which regulates the use of nuclear material.

Each type of nuclear material may have several isotopes. For example, Article XX of the IAEA Statute explains that uranium may be natural (the mixture of isotopes occurring in nature), enriched in the isotopes 235 or 233, or depleted in the isotope 235. Within this definition, nuclear materials can exist in many forms: metals, alloys, chemical compounds, concentrates, or as other material containing one or more of plutonium, uranium or thorium in sufficient concentrations as to require their control.