University of South Australia

UNIVERSITY OF SOUTH AUSTRALIA

BIOSAFETY MANUAL

CONTENTS

1. INTRODUCTION

In accordance with the requirements of the Work Health and Safety Act 2012 (SA), University of South Australia is required to exercise a duty of care towards staff, students, contractors and visitors. General principles guiding safe work at the University are provided in the University's Occupational Health Safety and Welfare Policy, Procedures and Guidance Notes at: Occupational Health, Safety and Welfare

To reduce risk, biological hazards need to be identified, assessed and managed. Before commencing a research project, or adding a new organism to an existing protocol, a risk assessment should be conducted by the chief investigator. A biological risk assessment checklist is available on the University Biosafety webpages. Whilst the chief investigator's professional judgement and management is paramount, the University also provides the services of the Institutional Biosafety Committee and University Biosafety Officer to advise, assess, record and monitor biological hazards.

The Gene Technology Act specifies requirements in relation to practices and procedures involving Genetically Modified Organisms (GMOs). The Office of the Gene Technology Regulator (OGTR) is the Australian Federal Government agent who enforces the Gene Technology Act by monitoring the containment, transport and management of genetically modified animals, plants and microbes The Institutional Biosafety Committee and the Research and Innovation Services report directly to the OGTR. Further information on the OGTR is available at: Office of the Gene Technology Regulator (OGTR)

2. LEGAL AND OPERATIONAL FRAMEWORK

Legislation and Standards guiding Biosafety work include the Work Health and Safety Act 2012 (SA), the Gene Technology Act 2000 (Commonwealth), the Gene Technology Regulations 2001 (updated September 2011, Commonwealth), Gene Technology Regulations 2017 No.196 (SA), Australian/New Zealand Standards Safety in Laboratories 2243.3 "Safety in Laboratories: Part 3: Microbiological safety and containment", Biosecurity Act, Defence and Strategic Goods Code, Security Sensitive Biological Agents Regulatory Scheme, Customs Act, Weapons of Mass Destruction Act, Defence Trade Controls Act, International Export Control Regimes and Treaties, International Aviation Laws, Civil Aviation Act and the Criminal Code Act 1995 (Commonwealth).

The management system requirements of SafeWork SA, Worksafe Australia, Administrator of South Australian OH&S and Workers Rehabilitation legislation and the OGTR are based on principles as found in the Standards ISO 9000 (Quality Assurance Systems) and ISO 14000 (Environment Management Systems).

3. DEFINITIONS

Accreditation

Organisations may be OGTR-accredited under Section 92 of the Gene Technology Act 2000. To gain accreditation, the organisation must show that it is able to establish and maintain, or have access to, an Institutional Biosafety Committee able to assess, approve and supervise Dealings.

Biological hazard

Any material of biological origin which has the capacity to be detrimental to other biological organisms. Biological hazards include:

- Microorganisms (including bacteria, parasites, fungi, viruses and prions) infectious to humans, animals and plants
- Organisms or microorganisms capable of producing toxins detrimental to humans, animals and plants
- Biological material of human, animal or plant origin transfected with infectious or toxin-producing microorganisms
- Biological material of human, animal or plant origin naturally containing infectious or toxin-producing microorganisms
- Any object or material contaminated with infectious material, including sharp objects

Certification

OGTR-accredited organisations may apply under of the Gene Technology Act 2000 to have facilities certified to specified Physical Containment (PC) levels. All GMO Dealings, apart from Exempt Dealings, must be carried out in appropriate certified facilities.

Dealing

In relation to a GMO, the word dealing means the following:

a. conduct experiments with the GMO;
b. make, develop, produce or manufacture the GMO;
c. breed the GMO;
d. propagate the GMO;
e. use the GMO in the course of manufacture of a thing that is not the GMO;
f. grow, raise or culture the GMO;
g. import the GMO;
h. transport the GMO;
i. dispose of the GMO;

Also, the possession, supply or use of the GMO for the purposes of, or in the course of, a dealing mentioned in any of the paragraphs (a) to (i).

DIR

Dealing with Intentional Release - Dealing involving intentional release of a GMO into the environment.

DNIR

Dealing with No Intentional Release - Dealing not involving intentional release of a GMO into the environment.

Exempt Dealing

Activities with genetically modified organisms which are classified under the Gene Technology Act as Exempt from licence. However, a person may only undertake the Exempt Dealing after the classification has been confirmed as such by the IBC.

Gene Technology

Any technique used for the modification of genes or other genetic material.

GMO

Genetically Modified Organism - An organism that has been modified by gene technology.

IBC

Institutional Biosafety Committee

NLRD

Notifiable Low Risk Dealings Activities with GMOs undertaken under containment, that have been assessed as posing low risk to health and safety of people and the environment provided certain risk management conditions are met. A person may only undertake the NLRD after it has been assessed as being an NLRD by an IBC.

OGTR

Office of the Gene Technology Regulator

Organism

A biological entity that is viable, capable of reproduction or capable of transforming genetic material. Note, this includes amongst other things, cell lines.

PC

Physical Containment - specialised containment facilities incorporating structural and behavioural measures to prevent contamination of personnel or the environment.

4. BIOSAFETY POLICY

To meet its duty of care, the University provides human, physical and financial resources to support biosafety and biosecurity, using specialist expertise as required. Under the Deputy Vice Chancellor of Research and Innovation Services, the University provides an Institutional Biosafety Committee (IBC) and a University Biosafety Officer (who also acts as the Executive Officer of the IBC). The University endeavours to ensure that activities involving biological hazards and gene technology are planned and executed in such a way that every reasonable precaution is taken to protect the health and safety of

each employee, student, the public, and environment, and to prevent damage to property.

Prior to commencement of any work utilising biological hazards or gene technology, the University examines the project in detail to identify and assess the risks and risk management. In addition, projects and their risks are reviewed on a regular basis.

The University also establishes and reviews guidelines for the containment and management of biological and biosecurity hazards. The University has established contingency plans for dealing with biosafety incidents and accidents.

The Biological Hazards and Genetically Modified Organisms Policy (Policy No. RES-4.3) will be reviewed at least every 3 years and when required to maintain currency with changes in relevant legislation.

5. UNIVERSITY RESPONSIBILITIES

The Vice-Chancellor (University of South Australia) has the ultimate responsibility for meeting the requirements of the Work Health and Safety Act 2012, Gene Technology Act, 2000, and other Regulations and Standards involved in biological dealings.

The University's Deputy Vice-Chancellor: Research and Innovation (DVCRI) is responsible for ensuring that biosafety and biosecurity are managed safely at the University and in accordance with all legislative requirements, and that resources are available to meet those requirements.

The Director: Human Resources has overall responsibility for the health, safety and welfare of University staff, students and volunteers, as well as for contractors and visitors to the University.

The Pro Vice Chancellors are responsible for ensuring allocation of resources to enable compliance with legislative requirements and University policies and procedures within each Division.

The Directors/Heads of Schools/Institutes/Centres have specific delegated responsibility for ensuring that University requirements are met within the sectors under their leadership.

Supervisors must ensure that:

- Approval for work is obtained from the Institutional Biosafety Committee prior to commencement of any project involving biological hazards or GMOs
- Approval to work with Controlled Technology is obtained from the Department of Defence
- Staff and students both under their supervision and working in the immediate vicinity are informed of any biological hazards or gene technology work, potential or actualised
- A copy of all GMO dealing licences under their leadership is provided to personnel working on the project.
- Personnel working with biologically hazards are familiar with the University Biosafety Manual and the Biosafety Guidelines and
    - adhere to the requirements of the Biosafety Manual and associated Acts and Regulations
    - have received training in all aspects of work involving biological hazards or gene technology

All persons undertaking work involving biological hazards or gene technology have an obligation to

ensure that:

- Their activities do not risk their own safety
- They do not expose other personnel to risk
- They comply with all requirements detailed in the AS/NZS 2243.3, Gene Technology Act, WHS Act, other relevant Acts and Regulations and the University Biosafety Manual and Biosafety Guidelines.

6. UNIVERSITY OGTR ACCREDITAION

The federal Office of the Gene Technology Regulator accredits organisations to manage risks that may be associated with dealings with GMOs. The Regulator granted accreditation to the University of South Australia, after determining that UniSA has the resources and the internal processes in place to enable it to effectively oversee work with GMOs. These resources and processes include:

- the use of a competent Institutional Biosafety Committee to provide on-site evaluation and guidance on containment and management of low-risk contained dealings
- and Executive Officer to provide quality assurance review of the information applicants submit to the IBC and Regulator.

7. INSTITUTIONAL BIOSAFETY COMMITTEE

7.1. Role of the Committee

The role of the Institutional Biosafety Committee (IBC) is to oversee research and teaching activity involving genetically modified organisms and Risk Group 2 biological hazardous material, to assist the University in fulfilling its duty of care and meet the aims of the Biosafety Policy.

7.2. Reporting Structure

The IBC reports directly to the DVCRI.
The Executive Officer reports directly to the Manager of Research Integrity, Research and Innovation Services

7.3. Terms of Reference for the Committee

To undertake the assessment, review and approval of all University activities involving the use of biological hazards, Genetically Modified Organisms and pathogenic organisms (including assessing the qualifications and experience of those involved).

To provide advice to the University community on potential hazards and their management.

To inspect physical containment facilities such as laboratories against the requirements of the OGTR at least once per year.

To ensure that biological and physical containment facilities at all levels meet, and continue to meet, the safety requirements set down in the Gene Technology Act and/or Standards Australia AS/NZS 2243.3: 2010 “Safety in Laboratories: Part 3: Microbiological safety and containment”.

To maintain a register of experiments and activities and those involved in using University

containment facilities.

To communicate changes in Gene Technology Regulations and Australia/New Zealand Standards of Safety in Laboratories (AS2243.3) or similar guidelines, to personnel working at the University.

To make inspections of laboratories or other work areas, to ensure that appropriate safety requirements are being met.

To make regular reports to the Research Integrity Committee. These reports will include:

- a list of the titles of projects and/or activities considered since the last report
- the names of those involved
- the location of the projects and/or activities
- their approval status
- the level of containment

To assist the University to prepare annual reports to the OGTR as required under the Gene Technology Regulations.

To prepare and retain minutes of all meetings and copies of all correspondence to researchers and others regarding requirements and other matters.

To consider any other matter relevant to biological safety referred to it by the Research Integrity Committee.

7.4. Committee Membership

The composition of the Committee comprises of a range of suitable experts and an independent person, such that it can competently carry out its duties.

The term of office for members is 3 years, with eligibility for further terms.

All members are invited to join the Committee by the DVCRI and have equal voting rights. The Committee should include at least the following members:

- Two molecular biologists with the requisite knowledge and expertise to assess, evaluate and oversee work involving the use of gene technology.
- One virologist and/or microbiologist with the requisite knowledge and expertise to assess, evaluate and oversee work involving the use of microorganisms.
- One researcher currently using gene technology in his/her research.
- A representative of the University Occupational Health and Safety Unit.
- A representative of the Facilities Management Unit.
- A representative of the Animal Ethics Committee.
- An independent member (i.e. a person with no personal, pecuniary or research association with the University).

- A Chairperson will be appointed by the DVCRI from the membership of the Committee.
- A Deputy Chairperson should be nominated by the Chair and elected by and from the Committee membership.
- Any other person or persons may be recruited by the Committee to assist in its function or to provide special expertise.

7.5. Executive Officer

An Executive Officer to conduct quality assurance of biological hazard and GMO dealing applications, and to assist the functions of the IBC is appointed by Research and Innovation Services. Currently this role is fulfilled by the University Biosafety Officer.

7.6. Meetings

The IBC will meet as required but at least twice a year. A quorum shall be half the membership plus one.

7.7. Conflict of Interest

A member of the IBC will not take part in the assessment/approval of a project/activity where the member is involved in that project/activity.

Any conflicts of interest must be declared prior to out-of-session assessment of applications and Minuted at the subsequent full Committee meeting that ratifies the assessment outcome.

7.8. Indemnification of Committee Members

The University shall indemnify individual members who serve on the IBC for any costs arising as the result of legal action against individual members, as a result of work that they undertake as a committee member.

7.9. Complaints Resolution

Where complaints are made against the decisions of the IBC, the Chairperson or Executive Officer will refer the matter to the DVCRI for resolution.

7.10. Records of Approvals

The IBC will keep/maintain records of all approvals for:

- Biological Hazards, Risk Group 2 and higher
- All genetic manipulation work that is classified by the IBC as:
    I. Exempt Dealings
    II. Notifiable Low Risk Dealings (NLRD)
    III. Dealings Not Involving Intentional Release (DNIR)
    IV. Dealings Involving Intentional Release (DIR)

8. MICROBIOLOGICAL RISK GROUPS

In Australia and New Zealand, the following classifications of microorganisms are used[1], which are based on the pathogenicity of the agent, the mode of transmission and the availability of preventive measures and treatment.

8.1. Human and Animal Infectious Microorganisms

Risk Group 1 (low individual and community risk)
A microorganism that is unlikely to cause disease in humans or animals.

Risk Group 2 (moderate individual risk, limited community risk)
A microorganism that can cause human or animal disease but is unlikely to be a significant risk to laboratory workers, the community, livestock, or the environment; laboratory exposures may cause infection, but effective treatment and preventive measures are available, and the risk of spread is limited.

Risk Group 3 (high individual risk, limited to moderate community risk)
A microorganism that usually causes serious human or animal disease and may present a significant risk to laboratory workers. It could present a risk if spread in the community or the environment, but there are usually effective preventive measures or treatment available.

Risk Group 4 (high individual and community risk)
A microorganism that usually produces life-threatening human or animal disease, represents a significant risk to laboratory workers and is readily transmissible from one individual to another. Effective treatment and preventive measures are not usually available.

8.2. Plant Infectious Microorganisms

Plant Risk Group 1
A microorganism that is unlikely to be a risk to plants, industry, a community or region and is already present and widely distributed.

Plant Risk Group 2
A microorganism that is a low to moderate risk to plants, industry, a community or region and is already present but not widely distributed.

Plant Risk Group 3
A microorganism that is a significant risk to plants, industry, a community or region and is exotic but with a limited ability to spread without the assistance of a vector.

Plant Risk Group 4
A microorganism that is a highly significant risk to plants, industry, a community or region and is exotic and readily spread naturally without the assistance of a vector.

[1] AS/NZS 2243.3:2010, Section 3

8.3. Invertebrates Carrying Microorganisms

Invertebrate Risk Group 1

Microorganisms carried by invertebrates where the microorganisms are unlikely to be a risk to humans or to the environment and are already present and widely distributed.

Invertebrate Risk Group 2

Microorganisms carried by invertebrates where the microorganisms are a low to moderate risk to humans or to the environment and are already present but not widely distributed. They have a limited ability to disperse because of low persistence of the microorganism outside the host. They are carried by invertebrates that are unlikely to be able to disperse or can be readily controlled.

Invertebrate Risk Group 3

Microorganisms carried by invertebrates where the microorganisms are a significant risk to humans or to the environment and are exotic and have the ability to disperse with or without the aid of a vector. They are carried by invertebrates that are able to disperse.

Invertebrate Risk Group 4

Microorganisms carried by invertebrates where the microorganisms are a highly significant risk to humans or to the environment and are exotic and readily able to disperse with or without the aid of a vector. They may be carried by invertebrates that are difficult to detect visually.

8.4. Working with Human, Animal or Plant Cells or Tissues

Human, animal or plant standard cell lines are considered to be in Risk Group 1, unless otherwise indicated by the supplier.

Human or animal clinical or diagnostic specimens are considered to be in Risk Group 2, unless a higher Risk Group is indicated by the source or clinical history of the samples. Preparation of primary cells from human or animal organs or tissues should be done in PC2 containment.

Work with human, animal or plant cells or tissues has the potential to be hazardous, dependent on the source of the material and the likelihood that it contains microorganisms or biotoxins. PC1 laboratories can be adequate for working with this material if good microbiological practises are followed, but a documented Risk Assessment should be carried out prior to use to determine what PC level is appropriate.

All cells and tissues must be decontaminated prior to disposal.

FACILITIES WITHIN THE UNIVERSITY ARE NOT CURRENTLY EQUIPPED TO WORK WITH RISK GROUPS 3 AND 4 MICROORGANISMS.

For examples of microbiological organisms in each of the Risk Groups, refer to Australian Standard 2243.3:2010 “Safety in Laboratories: Part 3: Microbiological safety and containment”. The Standard may be accessed through the SAI Global public database, Standards Online, via the University library.

9. CONTAINMENT FACILITIES

9.1. Physical Containment Levels

There are four physical containment levels corresponding to Risk Groups 1 – 4, as defined in Section 8 (above).

All work performed in a laboratory or facility of a specific containment level must follow the procedures set out for that level of containment. Whole animals, plants, aquatic animals and arthropods must only be grown, bred, propagated, experimented on and disposed in specialised facilities suitable for their containment and management.

Animals and plants inoculated with microorganisms from the above Risk Groups must be housed in containment facilities appropriate to the physical containment level of both the host and microorganism.

A summary of each Containment Level is provided below. Comprehensive information about the requirements for each Level is detailed in Australian Standard 2243.3:2010 "Safety in Laboratories: Part 3: Microbiological safety and containment" and the OGTR webpage.

Physical Containment Level 1 (PC1)
A Physical Containment Level 1 laboratory is suitable for work with microorganisms where the hazard levels are low, and where laboratory personnel can be adequately protected by good laboratory practice. The organisms used are not known to cause disease in healthy adults (i.e. organisms are in Risk Group 1). Work may be carried out on the open bench. Specimens that have been inactivated or fixed may be carried out in PC1 facilities.

Physical Containment Level 2 (PC2)
This level of facility with its practices and equipment is applicable to work carried out with microorganisms or material likely to contain microorganisms, which may be present in the community, where the microorganism may be associated with animal, plant or human disease of moderate severity, (i.e. Risk Group 2 microorganisms). With good microbiological techniques, work with these agents may be carried out on the open bench. If there is a risk from the production of aerosols, a biological safety cabinet should be used.

Physical Containment Level 3 (PC3)
This level of facility with its practices and equipment is applicable to clinical, diagnostic and other premises where work is carried out with indigenous or exotic microorganisms, and where there is a risk of serious infection to humans, animals or plants. Work with Risk Group 3 microorganisms must be carried out in Physical Containment Level 3 facilities. A Physical Containment Level 3 laboratory provides safeguards to minimize the risk of infection to individuals, the community and the environment. PC3 facilities are not available within the University at present.

Physical Containment Level 4 (PC4)
This level of facility with its practices and equipment is applicable to work with highly infectious microorganisms, including Risk Group 4 microorganisms that pose a high individual risk of life-

threatening disease and may be readily spread to the community. PC4 facilities are not available within the University at present.

9.2. OGTR Certification of Containment Facilities

The Gene Technology Act requires NLRD PC1, NLRD PC2, DNIR and DIR Dealings to be conducted within an OGTR certified facility.

The University applies to the OGTR for certification of its facilities as required. The University currently has OGTR certified Physical Containment Level 1 & Level 2 animal, arthropod, aquatic and laboratory facilities. Facilities are certified for a 5-year period. At the conclusion of this time the University may request recertification from the OGTR.

For OGTR certification of PC1 and PC2 animal, arthropod and laboratory facilities, both the Australian Standard 2243.3:2010 "Safety in Laboratories: Part 3: Microbiological safety and containment" and OGTR "Guidelines for Certification of a Physical Containment (TYPE) Facility" requirements must be adhered to. The Standard may be accessed through the SAI Global public database, Standards Online, via the University library. OGTR Guidelines for each type of facility may be downloaded from the OGTR website: OGTR Certification Guidelines for PC Facilities

9.3. Access to PC2 Facilities

Routine access to Biocontainment Facilities is only provided to persons that have undergone induction and biosafety training appropriate for the work conducted by the individual.

Routine access to PC2 facilities is only provided to scientists that have:

i) Undertaken General Laboratory Safety Induction

ii) Undertaken Biosafety Induction

iii) Been issued with the required personal protective equipment

iv) Been authorised as a laboratory user by the Facility/Operations Managers

Where access to Biocontainment Facilities is required for the purposes of maintenance or cleaning, access will only be provided to persons that have:

v) Undertaken the Cleaner/Maintenance Induction

vi) Demonstrated that they have any required personal protective equipment

vii) Been authorised by the Facility/Operations Managers of the School/Institute/Centre

Names of authorised persons will be maintained by the Facility/Operations Managers of the School/Institute/Centre, and a record of inductions kept.

Biocontainment Facilities at PC2 level shall be kept locked at all times when not in use. Only authorised persons shall be provided with a key or key card access to the laboratory.

WORKING SAFELY IS A CONDITION OF ACCESS TO PC FACILITIES. REPEATED FAILURE TO OBSERVE SAFE WORKING PRACTICES AND PROCEDURES WILL RESULT IN THE WITHDRAWAL OF ACCESS PRIVILEGES.

10. APPLICATION REVIEW PROCESSES

Applications assessed by the IBC include:

- Biological Hazards Applications
- Applications for Exempt, Notifiable Low Risk Dealings, DNIR and DIRs
- Minor Modification Requests

Appendix 1 contains review process flow diagrams outlining the type approvals required dependent on the type of work intended to be conducted.

10.1. Approval for Biologically Hazardous Work

Work specified as Risk Group 1 (refer Section 8) does not require approval from the IBC. However, PC1 procedures must be followed when working with these organisms.

All work with, including storage and importation, organisms classified as Risk Group 2 (Section 8) must be approved by the IBC and must be carried out in a PC2 microbiological facility. Procedures required for a PC2 microbiological facility, as set out in Australian Standard 2243.3:2010 "Safety in Laboratories: Part 3: Microbiological safety and containment" must be followed. Microbiological facilities are not OGTR certified but are audited by the IBC.

To obtain approval from the IBC:

i) Complete the Biological Hazard Application Form for the proposed project, acquisition or storage. The application form and information for obtaining IBC approval is available for download from the Research and Innovation Biosafety webpage

ii) Submit form and any supporting documents to the Executive Officer (EO) via email to biosafety@unisa.edu.au, for an initial review

iii) Once completed the application will be submitted to the Chair of UniSA IBC for consideration

iv) Depending on the risk rating, the application may then be distributed to the full Committee

v) Applicants will receive written determination of the IBC's assessment.

10.2. Approval for GMO Dealings

Licence Legislation

A GMO licence is a legal instrument issued by the Gene Technology Regulator (the Regulator) under the Gene Technology Act 2000 (the Act) that sets down the conditions under which specified dealings with genetically modified organisms (GMOs) must be undertaken. Licences may be issued for Dealings Not involving Intentional Releases (DNIRs), Dealings involving Intentional Releases (DIRs) or Inadvertent Dealings.

A person who deals with a GMO without a licence is guilty of an offence, punishable under Section 32 of the Act if:

i) the person deals with a GMO, knowing that it is a GMO; or

ii) the dealing with the GMO by the person is not authorised by a GMO licence, and the person knows or is reckless as to that fact; or

iii) the dealing with the GMO is not specified in an Emergency Dealing Determination, and the person knows or is reckless as to that fact; or

iv) the dealing is not a Notifiable Low Risk Dealing, and the person knows or is reckless as to that fact; or

v) the dealing is not an Exempt Dealing, and the person knows or is reckless as to that fact; or

vi) the dealing is not included on the GMO Register, and the person knows or is reckless as to that fact.

UniSA IBC Approval for GM Dealings

IBC approval must be obtained for:

i) All procedures involving GMOs conducted on UniSA premises

ii) DNIR and DIRs. Whilst work involving a DNIR or DIRs are licenced by the OGTR, they first need approval from an IBC.

iii) Storage of all GMOs (if not part of an approved Dealing)

iv) Importation or acquisition of all GMOs (if not part of an approved Dealing)

NOTE: UniSA is currently not accredited by the OGTR for any GMO work at PC3 or PC4 level.

To obtain approval from the IBC:

i) Complete the GMO Dealing application form, as available on the Biosafety and Gene Technology webpage.

ii) Submit forms to the EO via email to biosafety@unisa.edu.au, for an initial review.

iii) Once completed the application will be submitted to the Chair of UniSA IBC for consideration

iv) Depending on the risk rating, the application may then be distributed to the full Committee. Applications are mostly assessed and approved “out of session”.

v) Applicants will receive written determination of the IBC’s assessment.

vi) Applicants will also receive a Record of Assessment. Work can commence once this RoA has been received. Applicants will sign the RoA, to acknowledge receipt, and return to the EO.

vii) If the Dealing falls under the category of Dealing Not involving Intentional Release (DNIR) or a Dealing involving Intentional Release (DIR), a further application for a License will be required from the OGTR. After IBC approval has been received, downloaded the DNIR or

DIR application form from the OGTR's website http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/forms-1. For assistance with OGTR applications, contact the Chair or EO of the IBC biosafety@unisa.edu.au.

viii) Applicants may submit the completed DNIR or DIR form, along with the original UniSA IBC application and approval, directly to the OGTR. Alternatively, applicants may submit the completed form to the EO at biosafety@unisa.edu.au who will submit the application on their behalf.

Appendix 1 contains a flow diagram of this process.

11. WORKING WITH GMOS

All work involving GMOs comes under the control of the OGTR as set out in the Gene Technology Act 2000 and Gene Technology Regulations 2001 (updated September 2011). The requirements of the OGTR are detailed on the OGTR website at www.ogtr.gov.au.

Work with GMOs must only be conducted:

i) after approval has been granted from either the IBC or the OGTR, and receiving a RoA
ii) by people with appropriate training and/or experience
iii) within a facility certified to the appropriate Physical Containment level for the risk rating of the dealing, or another facility specifically approved in writing by the Regulator for a particular NLRD, and in accordance with any conditions imposed on the facility
iv) transported, stored and disposed according to the Regulator's Guidelines for the Transport, Storage and Disposal of GMOs, or alternative condition specifically approved in writing by the Regulator for a particular dealing

Limited extracts from the site are reproduced below but researchers wishing to work with a GMO (designated by the OGTR as a 'dealing') should access the OGTR website and consult the Gene Technology Act 2000 and the Gene Technology Regulations 2001.

FAILURE TO COMPLY WITH APPROPRIATE PC OPERATING PROCEDURES AND/OR LICENSING CONDITIONS WILL LEAD TO REVOCATION OF APPROVAL BY THE IBC AND/OR REVOCATION OF LICENCE BY THE OGTR.

11.1. What is a GMO?

A GMO is an organism that has been modified by the use of gene technology. Organisms that are **not** classed by the OGTR as GMOs are shown in Table 1.

Table 1: Organisms that are not GMOs (from Schedule 1 of the Act)

Item	Description of Organism
1	A mutant organism in which the mutational event did not involve the introduction of any foreign nucleic acid (that is, non-homologous DNA, usually from another species)
2	A whole animal, or a human being, modified by the introduction of naked recombinant nucleic acid (such as a DNA vaccine) into its somatic cells, if:

	the introduced nucleic acid is incapable of giving rise to infectious agents
3	Naked plasmid DNA, that is incapable of giving rise to infectious agents when introduced into a host cell
6	An organism that results from an exchange of DNA if: (a) the donor species is also the host species AND (b) the vector DNA does not contain any heterologous DNA
7	An organism that results from an exchange of DNA between the donor species and the host species if: (a) such exchange can occur by naturally occurring processes AND (b) the donor species and the host species are microorganisms that: (i) satisfy the criteria in AS/NZS 2243.3:2010 (Safety in laboratories, Part 3) for classification as Risk Group 1 AND (ii) are known to exchange nucleic acid by a natural physiological process AND (c) the vector used in the exchange does not contain heterologous DNA from any organism other than an organism that is involved in the exchange

11.2. What is Gene Technology?

Gene technology is any technique used for the modification of genes or other genetic material. Techniques that are not classed by the OGTR as gene technology are shown in Table 2

Table 2: Techniques that are not gene technology (from Schedule 1A of the Act)

Item	Description of technique	Conditions
1	Somatic cell nuclear transfer	IF: the transfer does not involve genetically modified material
2	Electromagnetic radiation induced mutagenesis	-
3	Particle radiation induced mutagenesis	-
4	Chemical induced mutagenesis	-
5	Fusion of animal cells, or human cells	IF: the fused cells are unable to form a viable whole animal or human
6	Protoplast fusion, including fusion of plant protoplasts	-
7	Embryo rescue	-
8	*In vitro* fertilisation	-
9	Zygote implantation	-
10	A natural process Examples of natural processes include conjugation, transduction, transformation and transposon	IF: the process does not involve genetically modified material

Item	Description of technique	Conditions
	mutagenesis	

CRISPR/Cas, TALEN, ZFN and MNs

Clustered regularly interspaced short palindromic repeats/Cas (CRISPR/Cas), Transcription activator-like effector nuclease (TALENs), Zinc finger nucleases (ZFN), and meganucleases (MNs) use nucleases to make site-specific double-stranded breaks in the genome.

When They Are Not Gene Technology

The IBC considers these technologies do **not** fall under the gene technology Act and Regulations if:

Genome editing technology that does not involve introduction of DNA into cells or introduction of technology components into cells that operate through a DNA-intermediate (e.g. reverse transcription systems) or cause changes that are indistinguishable from naturally occurring mutation events do not produce genetically modified organisms.

Example: deletion mutations generated by injection of CAS9 mRNA and gRNA into mouse zygotes to create “knock-out” mice.

This is does not require a Dealing authorisation from the IBC.

When They Are Gene Technology

The IBC considers these technologies to fall under the gene technology Act and Regulations if:

DNA is introduced into cells (e.g. during genome editing of plants) or homology directed repair is attempted.

Example: creating a precisely defined mutation into the mouse genome by injection into mouse zygotes of CAS9 mRNA, gRNA and an oligonucleotide bearing the mutation sequence.

Prior to commencing the work, approval must be obtained from the IBC under Exempt or NLRD classification, as defined by the Office of the Gene Technology Regulator (OGTR)

siRNA In Cells As Dealings

As the Gene Technology Regulations stand at present any nucleic acid (such as non-replicating AAV expressing siRNA) added into cells or plants (in a vector or not) that is not a whole animal or a human being, is gene technology, and often classified as an NLRD PC2 dealing. On the other hand, nucleic acid, (such as non-replicating AAV expressing siRNA), which is added to a whole animal or human being (Schedule 1, regulation 5 (p34) is **not** gene technology.

Almost all oligonucleotide and siRNA dealings will be classified as Exempt Dealings- **however there are exceptions.**

An example of an exception is putting siRNA into a microalgae. The advice from the OGTR is that this is an NLRD PC-2 dealing, on two counts:

1. A microalgae is not a whole animal or a human being
2. The microalgae were not listed under Exempt hosts

These types of experiments come under the definition of Gene Technology for the time in which the added nucleic acids are intact. Whilst siRNA degrade with time confirming that the nucleic acids have degraded is very difficult and time consuming. Hence it is recommended by the OGTR that all siRNA and oligonucleotide work in cells, or any microorganism that is not in a whole organism or a human being, need classification and approval by the IBC. Even if the nucleic acid is not part of a vector and therefore non-replicative, researchers must notify the Institutional Biosafety Committee.

Gene Drives

Gene drives are genetic elements that are favoured for inheritance, and which can therefore spread through populations at a greater rate than genes with standard Mendelian inheritance. Gene drives can only spread from sexually reproducing parents to their offspring.

If gene technology is used to introduce or create a gene drive in an organism, the resulting organism will be a GMO and subject to regulation under the Gene Technology Act 2000.

There are no specific categories for gene drives in the Regulations. Under Schedule 3 of the Regulations research involving GM plants and GM animals containing engineered gene drives in certified physical containment facilities will generally be classified as NLRDs.

However, dealings with some GMOs containing engineered gene drives may require a licence from the Regulator, depending on the type of organism and the nature of the modification. For example, if the introduced nucleic acid encodes a toxin, or if the modification enables the organism to produce infectious agents, a licence from the Regulator is required.

Gene Drives Give An Advantage

Any GMO with a functional engineered gene drive is considered to have an advantage (as defined in regulation 3) due to its enhanced ability to contribute to the gene pool, and a minimum containment level of PC2 is required.

11.3. What is a Dealing?

A Dealing includes any of the activities listed in Table 3

Table 3: OGTR definition of Dealings

Conduct experiments with the GMO
Make, develop, produce or manufacture the GMO
Breed maintain, manage or supply the GMO
Use, extract or collect tissues from genetically modified laboratory animals (including sperm, ova and embryos)
Propagate the GMO
Cross breed wild type and genetically modified laboratory animals, plants or organisms
Infect a microorganism, plant or animal with a genetically modified risk group 2, or above, microorganism
Use a microorganism, plant or animal capable of secreting or producing an infectious agent as a result of the genetic modification

Use the GMO in the course of manufacture of a thing that is not the GMO
Grow, raise or culture the GMO
Import the GMO
Transport the GMO
Dispose of the GMO
Store a GMO
Possess, supply or use of the GMO for the purposes of, or in the course of, a dealing

11.4. What is an Exempt Dealing?

Exempt Dealings are classified as Dealings under the Act but do not require a licence specific to the work.

Exempt dealings must be approved by the IBC but do not need to be reported to the OGTR.

There is no prescribed PC facility requirement for Exempts dealings, but the OGTR strongly suggests that all Exempt Dealings be carried out under PC1 conditions, a view that is supported by the IBC. Activities described as Exempt Dealings are shown in Table 4 in Appendix 2.

11.5. What is a Host/Vector System?

The OGTR specifies which host/vector systems may be used for Exempt Dealings.

A vector system is the means by which donor nucleic acid is introduced into a host cell.

The host is the type of cell into which donor nucleic acid is introduced.

Vector systems can include plasmids, non-conjugative plasmids, bacteriophages or viruses.

> Non-conjugative plasmid means a plasmid that is not self-transmissible, and includes, but is not limited to, non-conjugative forms of the following plasmids:
>
> - bacterial artificial chromosomes (BACs)
> - cosmids
> - P1 artificial chromosomes (PACs)
> - yeast artificial chromosomes (YACs)

Donor nucleic acid may also be introduced into the host using a non-vector system, which means a system by which donor nucleic acid is or was introduced (for example, by electroporation or particle bombardment) into a host cell:

- in the absence of a nucleic acid-based vector
- using a nucleic acid-based vector in the course of a previous dealing and the vector is:

I. no longer present

II. present but cannot be remobilised from a host cell

Approved host/vector systems are detailed in Table 5 in Appendix 3.

11.6. What is a Notifiable Low Risk Dealing?

Notifiable Low Risk Dealings (NLRDs) are activities with GMOs undertaken in containment (i.e. not released into the environment) that have been assessed as posing low risk to the health and safety of people and the environment provided certain risk management conditions are met.

The types of GMOs and activities classified as NLRDs are specified in Schedule 3 of the *Gene Technology Regulations 2001* (the Regulations).

NLRDs must be approved by the IBC and need to be reported to the OGTR by the accredited organisation; the OGTR will assign its own identification numbers to reported NLRDs; this information, including the name of the accredited organisation and the title of the Dealing, is made publicly available on the OGTR website.

Classifications of NLRDs are shown in Tables 6 and 7 in Appendix 4.

11.7. Dealings that are NOT Notifiable Low Risk Dealings

A Dealing that is not an Exempt Dealing or a Notifiable Low Risk Dealing can only be undertaken by a person who is licensed, under the Act, for the Dealing.

A person may only apply for a license after seeking approval for the project from the IBC.

Dealings NOT involving an intentional release of GMOs into the environment (DNIRs) are dealings with GMOs in contained facilities which do not meet the criteria for classification as Exempt Dealings or Notifiable Low Risk Dealings. These dealings must be licensed by the Gene Technology Regulator (the Regulator).

Dealings with a GMO licensed as a DNIR must not involve release into the environment.

The contained facilities used for conducting DNIRs must be certified and typically range from Physical Containment Level 2 (PC2) to Physical Containment Level 4 (PC4). The appropriate level of containment is determined by the Risk Group classification of the wild type (non-genetically modified parent) organism as outlined in the Australian/New Zealand Standard (AS/NZS 2243.3:2010) AND the risk(s) identified for dealings with the specific GMO.

The kinds of dealings with GMOs that are classified as DNIRs are described in Schedule 3, Part 3 of the Gene Technology Regulations 2001 (the Regulations) and are higher risk dealings than NLRDs. Dealings considered to carry a higher risk than those categorised as NLRDs, which may be undertaken only under a licence from the OGTR, are shown in Table 8 in Appendix 5.

In general, DNIRs consist of dealings with GM pathogenic organisms, or GM organisms containing

higher risk genes from pathogens or genes that encode toxins or confer an oncogenic modification or immuno-modulatory function.

Dealings involving an Intentional Release of GMOs into the Australian environment (DIRs) are dealings with GMOs outside contained facilities. These can range from small scale field trials (limited and controlled releases) of GMOs to general/commercial release of GMOs.

11.8. Dealings with Viral Vectors

Both modified and unmodified viral vectors have the potential to transduce human cells. Some retroviruses are considered highly stable within the environment with reports of survival of up to four weeks on glass at ambient temperatures. Although most viruses exhibit low pathogenicity in much of the human population and are inactivated by the human immune system, those individuals who suffer from eczema or are immune-compromised at the time of exposure (including pregnant women) are at a high risk of developing serious complications.

Before commencing work with *retroviruses*, *lentiviruses* or *Vaccinia* viruses, staff and students must undertake face to face personalised training and prove competence in risk minimisation and management. Personnel working with the dealing must be given a copy of the licence and informed of the risks involved. Personnel not working directly with the dealing but working in the vicinity must also be informed of the risks involved in the dealing.

If available, vaccination should be undertaken by all personnel working with the retrovirus, unless contraindicated by a medical professional or the person declines vaccination and signs a declaration to that affect.

To reduce the exposure to mucus membranes, safety glasses must be donned before entering the area where retroviruses are used. Eczema, cuts and abrasions must be covered before entering the laboratory. If skin impairments cannot be covered completely then staff and students must be prohibited from working with infectious viruses. All aerosol generating procedures, including amongst other things pipetting, loading and unloading of centrifuge rotors, and vortexing, must be conducted in a Biosafety Cabinet Class II. Centrifuge rotors must have aerosol-tight seals.

To avoid needle stick injury or infection through damaged skin, the use of sharps must be minimised. When a needle is required to deliver the viral vectors to animals, all injections must be performed in a Class II cabinet with the operator wearing needle resistant gloves (Turtle-skin^{R}). No needles should be re-capped, and all discarded needles must be placed into sharps containers.

All transport of viral particles, in or out PC2 facilities, must be undertaken in sealed primary and secondary containers. When transporting outside of a BSC, safety glasses must also be worn.

Double gloves, front covering lab coats and closed in shoes must be worn at all times. In the slight chance that skin exposure occurs, thorough washing with soap (where appropriate) and water should be undertaken as soon as possible, to remove the vector from the exposed surface.

Dealings with viral vectors can be classified in the DNIR, NLRD, and Exempt categories. Guidance on

the correct classification of contained dealings with viral vectors is available in Appendix 6.

12. IMPORTATION OF BIOLOGICAL MATERIALS

Imported biological materials can potentially harm humans, animals or plant health, or the environment. Biosecurity risks are subject to biosecurity control when an aircraft or vessel carrying the goods enters Australian territory. Biosecurity in Australia is the responsibility of the Federal Department of Agriculture and Water Resources. As well as the Federal laws, States and Territories laws concurrently impose conditions on importing dangerous goods. Biosecurity risks are managed by imposing restrictions or conditions on the type of goods imported, the premises into which they are imported and the method of importation.

The Governor-General, the Health Minister and the Agriculture Minister of Australia can also declare biosecurity emergencies without warning.

Biosecurity Officers of the Department of Agriculture and Water Resources have warrants to enter premises, in some cases without notice, and exercise powers for the purpose of maintaining biosecurity.

12.1. IBC Approval to Import

An assessment must be made of the level of biosecurity risk associated with hazardous biological goods, and the measures required to reduce the risk. IBC approval must be obtained before importing into UniSA, any Risk Group 2 or higher, or Genetically Modified organism. Completed Biological Hazard or GMO application form should be submitted to biosafety@unisa.edu.au.

12.2. Import Permits

Importation of biological material into Australia requires an import permit. Persons wanting to use restricted materials are required to obtain a permit for importation and use of the materials. All imports under DAWR permits must abide by the conditions listed on the permit.

To determine whether an Import Permit is required, check the DAWR Biosecurity Import Conditions (BICON) database. BICON Provides specific information about goods and commodities and their intended uses. BICON will identify whether an import permit is required. The Import Permit will list specific conditions relating to the importation.

Please refer to the following DAWR websites for information about:

- Guidance information and import permit application forms for biologicals
- Microorganisms
- Antigens for Laboratory Use
- Plant Pathogens for Research and Diagnostic Purposes
- Animal Fluids and Tissues
- Microorganisms and/or Genetic Material for In Vivo Use in Plants
- Starter Cultures

- Laboratory Reagents
- Human Fluids and Tissues
- Animal Reproductive Material

Plant material and plant related products may also be subject to South Australian conditions of entry. The Plant Quarantine Standard is the reference to determine the entry requirements for fruit, vegetables, plants, plant machinery and plant related products into South Australia.Copies of Import Permits are available from the relevant School/Institute/Centre Operations Managers. Before importing a good, check that the School import permit will satisfactorily cover your importation.

For further information about DAWR import permits and application forms, refer to the DAWR webpages at http://www.agriculture.gov.au/import.

12.3. Importation of Non-Commercial Goods

It is not uncommon for researchers to import unique research cell lines, plasmid vectors, microorganisms and viruses into Australia from research collaborators or research institutions which have created, propagated or manufactured the goods. In addition to the conditions placed on commercial goods, non-commercial goods require extra administration.

Recording Non-Commercial Imports and Exports

Each research unit should have a database into which all non-commercial goods imported or exported are recorded.

Records for imported or exported goods should include:

- quarantine entry number (where applicable)
- name of the supplier
- import permit number or DAWR approval number (where applicable)
- description of the materials
- date the material is received or exported
- location
- records of any derivatives and additional cultures/material or substance grown from the original material subject to quarantine
- where applicable, quantities (e.g. kg, litres) of goods received, destroyed and in storage
- batch number (where applicable)
- proposed research and analysis details
- details of any special treatments
- method and date of disposal/destruction of goods subject to quarantine and any direct or indirect derivatives
- method and date of waste disposal/destruction
- comprehensive details of any breaches of goods subject to quarantine from the facility

12.4. Approved Arrangement Sites

As a condition of import, DAWR may impose post-entry quarantine conditions which require that

certain products be restricted for use within quarantine facilities. The purpose of approval is to satisfy DAWR that the facility protects Australia's animal, plant and human health status and to ensure that post-entry quarantine procedures are followed.

The *Biosecurity Act 2015* sets out the requirements and responsibilities for containment facilities, where the premises are utilised for research, analysis and/or testing of imported biological material including microorganisms, animal and human products and soil. Approved Arrangement Site include microbiological facilities, animal facilities and plant laboratories, whether integral or separate to the facility. Where applicable, the criteria should be read in conjunction with the appropriate Australian/New Zealand Standard™ as listed in individual classes. In the case of biological goods, this is the AS/NZS Part 3 Microbiological safety and containment, 2243.3:2010.

DAWR approves three types of quarantine facilities: Microbiological Containment, Indoor Animal Containment and Outdoor Animal Containment. There are four levels of containment; Quarantine Containment Level 1 (QC1), Level 2 (QC2), Level 3 (QC3), Level 4 (QC4). The University of South Australia has an Indoor Animal Containment Approved Arrangement Site (QC2), and two Microbiological Containment Approved Arrangement Site (QC2) on the Mawson Lakes Campus, MM3-10C and X1-47.

13. DEFENCE EXPORT CONTROLS – BIOLOGICAL WEAPONS

The federal defence export control system aims to prevent goods and technologies that can be used as biological weapons (amongst other things) from reaching the wrong hands. The controls apply to the export of tangible and intangible goods, technology and information.

Examples of tangible goods:

- Naked DNA plasmid which codes for a genetic modification producing a security sensitive toxin
- Some Risk Group 3 and above microorganisms
- Glycerol stock of a genetically modified microorganism expressing a highly pathogenic and treatment resistant microorganism
- Embryos or sperm of parasitic insects or aquatic animals that have been genetically modified to made them an uncharacterised human pathogen.

Examples of intangible goods:

- Email, fax, USB stick, laptop carrying the DNA code to sequence to genetically modify a microorganism which makes it a highly pathogenic, treatment resistant microorganism
- Publication of information which could enable others to generate a biological weapon

There are also restrictions on brokering of controlled goods or technology. Brokering is when a person or organisation acts as an agent or intermediary in arranging the supply of controlled goods, software and technology between two places located outside of Australia. For the activity to be considered brokering, the person supplying must receive money or non-cash benefit or advance their political, religious or ideological cause for arranging the supply.

Significant penalties apply to individuals where these export conditions are not met: up to $425,000 fine and/or 10 years imprisonment.

Permits may be issued by the federal government for supply, publication or brokering of controlled goods. To assess whether goods, technology and information are controlled and require a permit, a self-assessment tool is available through the UniSA Defence Export Controls webpage.

Enquires can also be made through UniSA Research and Innovation Services.

14. SECURITY SENSITIVE BIOLOGICAL AGENTS

The deliberate release of harmful biological agents such as viruses, bacteria, fungi and toxins have the potential to cause significant damage to human health, the environment and the Australian economy. To minimise the risk of use for terrorism or criminal purposes, the Federal Government regulates the secure storage, possession, use and transport of security sensitive biological agents.

The List of Security Sensitive Biological Agents as of March 2016 are:
Tier 1 (with toxin thresholds)
Abrin (5mg)
Bacillus anthracis (Anthrax)
Botulinum toxin
Ebolavirus
Foot-and-mouth disease virus
Highly pathogenic influenza virus, infecting humans
Marburgvirus
Ricin (5 mg)
Rinderpest virus
SARS *coronavirus*
Variola virus (Smallpox)
Yersinia pestis (Plague)

Tier 2
African swine fever virus
Capripoxvirus (Sheep pox virus and Goat pox virus)
Classical swine fever virus
Clostridium botulinum (Botulism)
Francisella tularensis (Tularaemia)
Lumpy skin disease virus
Peste-des-petits-ruminants virus
Yellow fever virus (non-vaccine strains)

SSBA reporting forms allow entities and facilities to report to the Department of Health any reportable events.

For further information on reporting forms, facility requirements, inspections, handling, "loss, theft and accidental release" procedures, law enforcement and transport, see the Department of Health's website.

15. TRAINING IN BIOSAFETY

15.1. Responsibility

The University - Under the SA Work Health and Safety Act 2012 it is the University's responsibility to ensure that all personnel working with biological hazardous or genetically modified organisms, know about—

(i) the hazard or the risk; and

(ii) ways of eliminating or minimising the risk

The University of South Australia is committed to providing and maintaining a safe and healthy workplace and study environment for all employees, students, contractors, labour hire, volunteers, visitors and others associated with university business. This commitment is expressed in the Health Safety & Injury Management Policy. The University identifies Council members, Audit and Risk Management Committee members and the Senior Management Group as officers under the Work Health and Safety Act 2012 (SA) and accordingly they have a duty of care to meet and monitor associated due diligence requirements.

All workers - All workers are responsible to assist the university meet the obligations of a Person Conducting a Business or Undertaking (PCBU) and associated primary duty of care to a reasonably practicable standard by taking reasonable care in relation to their duties. Among others, Heads of School/Institute/Centre, the University Biosafety Officer, laboratory managers and operation managers fall into this category.

The IBC - It is not the IBC's responsibility to train personnel. However, under the Gene Technology Act, the IBC of an accredited organisation (UniSA) is compelled to confirm that personnel undertaking a dealing are adequately trained before the IBC issues a licence to the Chief Investigator.

Project Leaders - Under both the Gene Technology Act and University policy, Chief Investigators or Project Leaders are primarily responsible for training all personnel under their supervision: to ensure that staff and students working with the microorganisms are properly trained to contain and manage the microorganism and any of their infectious agents. It is also the responsibility of the Chief Investigator to inform personnel working in the vicinity of the work (but not on the project), of the risks involved in the work. The University requires the Chief Investigator provide the IBC with a copy of their staff/student training program. Records of completed training must be signed off by the relevant personnel and the supervisor and kept locally.

To monitor this the EO requests Research Leaders or laboratory managers for a scan of the training program and records, before conducting an annual inspection of the laboratories. The EO stores these records in a database and refers to this when a licence application is reviewed. The EO also records

attendance at the Biosafety Information Day and completion of online training modules.

15.2. Induction

It is the responsibility of Facility/Operation Manger to oversee the induction of contractors, visitors and facility staff working with, or within an area where work is conducted with, GMOs or Biological Hazards.

15.3. Biosafety Information Day

Research and Innovation Services conducts one biosafety training session each year; usually during Semester 1. Each person working with GMOs or Risk Group 2 Biological hazards will be required to attend this training session and renew certification every 3 years.

15.4. Online Training Modules

The University HS&IM – Safety & Wellbeing provide two relevant online Virtual Accident training modules: Biosafety 1 (Biosafety Principles) and Biosafety 2 (Gene Technology).

Biosafety Principles

Discusses the safe work practices associated with biological hazards, particularly microbiological organisms, in the workplace. Also covers:

- Legislative and regulatory obligations
- Routes of exposure and methods of contamination
- Biohazard classification and the containment principle
- Spills, waste containment, decontamination, disposal and transport
- Personal protective equipment (PPE) and physical containment scenarios.

Gene Technology

This module covers:

- Genetically modified organisms and products
- Legislative and regulatory obligations
- Personal protective equipment and facility checklist
- Storage, decontamination, disposal and transport
- Record keeping

If personnel have problems logging in, please e-mail HSIM.SafetyWellbeing@unisa.edu.au

15.5. Procedural and Project Specific Training

It is the responsibility of Chief Investigator/Project Leader to ensure that personnel involved with the project are aware of the risks involved and are trained in the safe containment and management of the biological hazard.

For all biological hazardous projects, the minimum training must include amongst other things the reading of:

- Australian/New Zealand Standard for microbiological safety and containment AS/NZS 2243.3:2010 (available through the library)

- Technical training on all procedures, including infection control within the facility

In addition to the above, for GMO Dealings training will at a minimum include the reading of the:

- Dealing Record of Assessment or Licence
- Behavioural requirements for Office of Gene Technology Regulator certification for PC2 laboratories,
- OGTR Guidelines for Transport, Storage and Disposal of genetically modified organisms,

Before commencing work with *retroviruses*, including *lentiviruses* and *Vaccinia* viruses, staff and students must undertake face to face personalised training and prove competence in risk minimisation and management. After staff and students have been trained in the specific procedure, personnel should be asked to sign a training record and make this record available at the next IBC laboratory inspection.

15.6. Records of Training

Records of biosafety training, including training in OGTR requirements, must be kept by the person nominated as "Responsible Person" for the facility where the work is carried out. These will be required to be produced during the annual audit of the area.

It is recommended that all project supervisors retain a copy of the Research and Innovation Services certificate issued to all staff and students who have attended a training session.

16. MONITORING AND ENFORCEMENT OF BIOLOGICAL HAZARD AND GENE TECHNOLOLOGY FACILITIES AND PROCEDURES

16.1. Monitoring

Monitoring activities include:

i) The University Biosafety Officer creates dealing and laboratory profiles to aid strategic planning for monitoring activities

ii) The IBC will perform an arranged audit of all OGTR-certified PC1 and PC2 facilities at UniSA on an annual basis. The IBC will perform an arranged audit of all microbiological facilities using Risk Group 2 organisms for compliance with PC2 microbiological procedures on an annual basis.

iii) Six months before the expiry of a Genetically Modified dealing or Biological Hazard dealing licence, the University Biosafety Officer will comply a list of all the dealings managed by the Principle Investigator. The Executive Officer will present this list to the Principle Investigator, invite them to review their dealings and meet with Chair of the IBC to discuss.

iv) The OGTR, DAWR, WorkSafe SA and the IBC may conduct unannounced inspections/audits of facilities and procedures.

v) The OGTR and the IBC conduct audits and reviews practices

vi) The OGTR, DAWR, WorkSafe SA, University Biosafety Officer and the IBC may investigate any occurrence involving a spill or unintentional release of microorganisms or GMOs, or

allegation of misconduct.

vii) Training Records are monitored by the University Biosafety Officer against staff and students registered as investigators on biological hazard and GMO applications.

16.2. Enforcement

The cooperative compliance approach is always the preferred approach. Compliance starts with educational interactions with individuals, laboratory managers and research leaders willing to do the right thing.

All reporting of potential breach of regulations will be reviewed and assessed. Any information concerning alleged non-compliant conduct of work with GMOs, Biological Hazards, Security Sensitive Biologicals, Autonomous Sanctions and Defence Export Controls, provided to the University Biosafety Officer, Manager of Research Integrity, Chair of the Institutional Biosafety Committee, the OGTR, DAWR or WorkSafe SA, will be treated in the strictest confidence.

If monitoring shows changes in compliance commitment firm direction is applied. If individuals, research groups or Schools/Institutes/Centres fail to correct compliance issues, non-criminal sanctions are applied. Intentional disregard would lead to referral for criminal prosecution.

There are a range of enforcement powers, starting with the power to direct individuals or organisations to return to compliance and undertake necessary actions to protect the safety of human and the environment. In extreme circumstances, significant financial penalties or prison terms may be imposed by the courts.

17. REPORTING

17.1. Reporting to the OGTR

Routine monitoring and compliance activities are reported to the OGTR. The IBC has the responsibility for reporting to the OGTR:

- The membership of the IBC
- Details of current NLRD, DNIR and DIR projects
- Details of certified containment laboratories, animal facilities and plant facilities
- Annual report as an accredited organisation
- Any issues of concern to the OGTR

17.2. Reporting to the University

The IBC has the responsibility for reporting to the DVCRI:

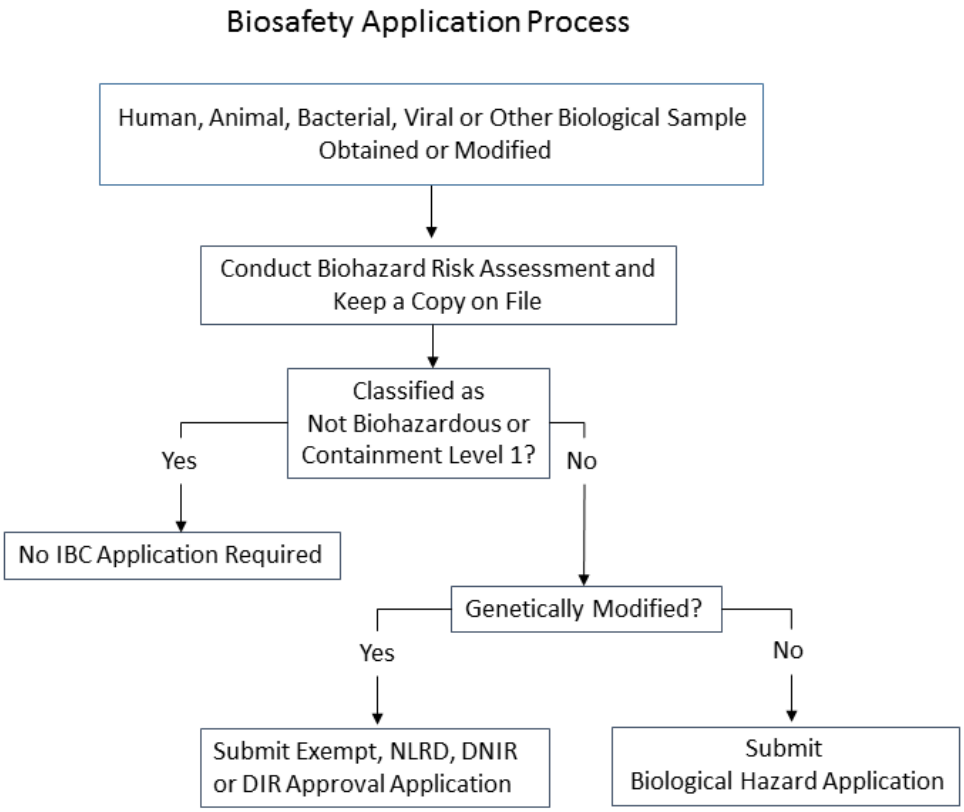
- Activities of the IBC, by way of Institutional Annual Report
- Copy of the annual report submitted to OGTR

18. REVIEW OF BIOSAFETY MANUAL

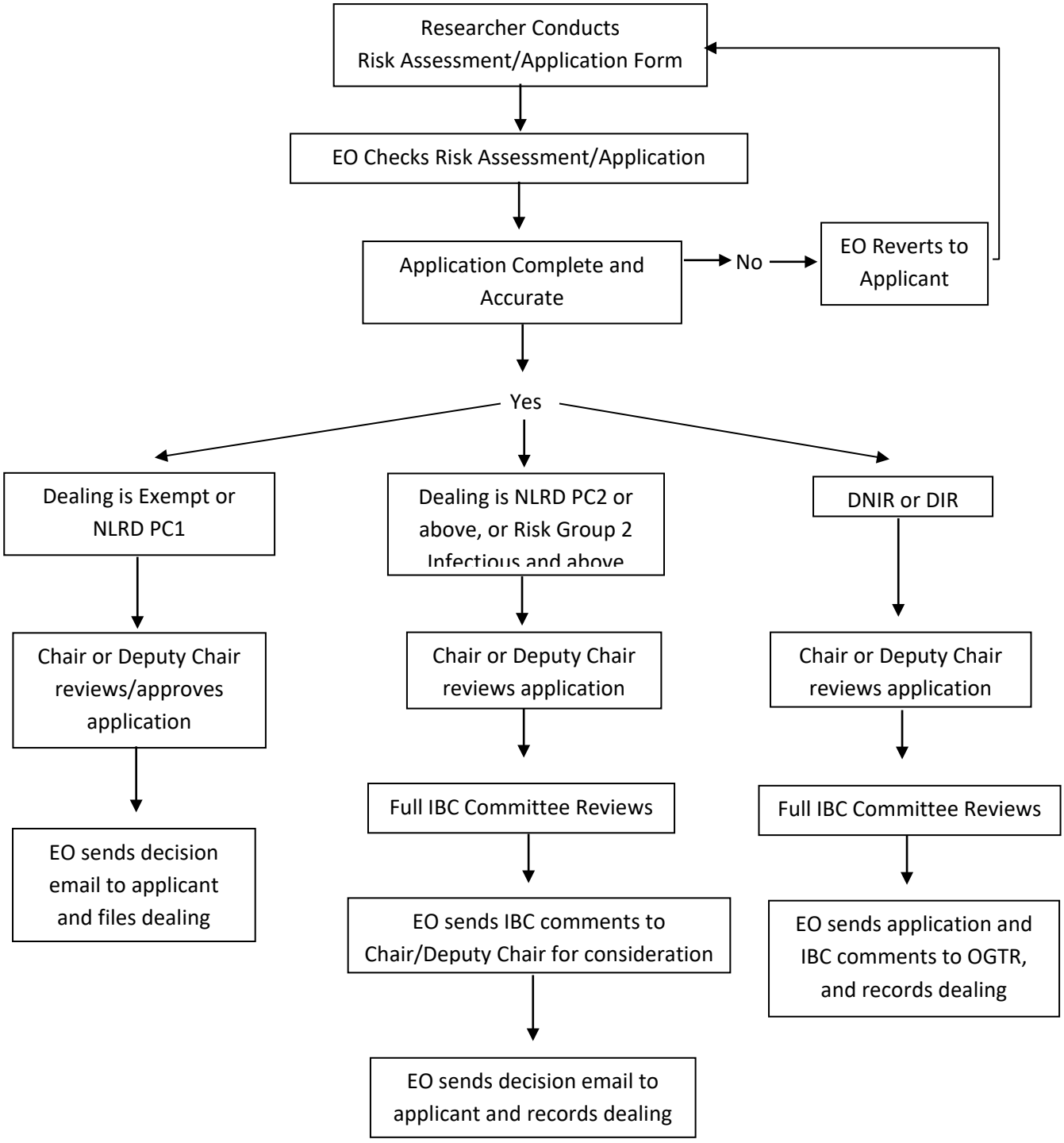
This manual shall be reviewed biennially by the University Biosafety Officer and the IBC.

19. APPENDICES

19.1. **Appendix One** – Application Process Diagrams



Applications to Work with Genetically Modified Organisms



19.2. **Appendix Two** - List of Exempt Dealings

Table 4: List of Exempt Dealings (from Schedule 2 Part 1 of the Act)

Item	Description of Dealing	Conditions
2	A dealing with a genetically modified *Caenorhabditis elegans*	UNLESS: an advantage is conferred on the animal by the genetic modification OR as a result of the genetic modification, the animal is capable of secreting or producing an infectious agent
3	A dealing with an animal into which genetically modified somatic cells have been introduced	IF: the somatic cells are not capable of giving rise to infectious agents as a result of the genetic modification AND the animal is not infected with a virus that is capable of recombining with the genetically modified nucleic acid in the somatic cells
3A	A dealing with an animal whose somatic cells have been genetically modified *in vivo* by a replication-defective viral vector	IF: the *in vivo* modification occurred as part of a previous dealing AND the replication defective viral vector is no longer in the animal AND no germ line cells have been genetically modified AND the somatic cells cannot give rise to infectious agents as a result of the genetic modification AND the animal is not infected with a virus that can recombine with the genetically modified nucleic acid in the somatic cells of the animal

Item	Description of Dealing	Conditions
4	A dealing involving a host/vector system mentioned in Table 5 AND producing no more than 25 litres of GMO culture in each vessel containing the resultant culture	AND THE DONOR NUCLEIC ACID: (a) must satisfy either of the following requirements: (i) it must not be derived from organisms implicated in, or with a history of causing, disease in otherwise healthy human beings, animals, plants or fungi OR (ii) it must be characterised and the information derived from its characterisation show that it is unlikely to increase the capacity of the host or vector to cause harm Example: Donor nucleic acid would not comply with subparagraph (ii) if its characterisation shows that, in relation to the capacity of the host or vector to cause harm, it provides an advantage or adds a potential host species or mode of transmission or increases its virulence, pathogenicity or transmissibility AND (b) must not code for a toxin with an LD_{50} of less than 100 μg/kg AND (c) must not code for a toxin with an LD_{50} of 100 μg/kg or more, if the intention is to express the toxin at high levels AND (d) must not be uncharacterised nucleic acid from a toxin-producing organism AND (e) must not include a viral sequence unless the donor nucleic acid: (i) is missing at least 1 gene essential for viral multiplication that: (A) is not available in the cell into which the nucleic acid is introduced AND (B) will not become available during the dealing AND (ii) cannot restore replication competence to the vector
5	A dealing involving shot-gun cloning, or the preparation of a cDNA library, in a host/vector system mentioned in Item 1 of Table 5	IF THE DONOR NUCLEIC ACID is not derived from either: (a) a pathogen OR (b) a toxin-producing organism

19.3. **Appendix Three** – Host/Vector Systems for Exempt Dealings

Table 5: Host/Vector Systems for Exempt Dealings (as per Schedule 2 Part 2 of the Act)

Item	Class	Host	Vector
1	Bacteria	*Escherichia coli* K12, *E. coli* B or *E. coli* C or *E. coli* Nissle 1917 – any derivative that does not contain: (a) generalised transducing phages OR (b) genes able to complement the conjugation defect in a non-conjugative plasmid	1. Non-conjugative plasmids 2. Bacteriophage (a) lambda (b) lambdoid (c) Fd or F1 (e.g. M13) 3. None (non-vector systems)
		Bacillus – specified species – *asporogenic* strains with a reversion frequency of less than 10–7: (a) *B. amyloliquefaciens* (b) *B. licheniformis* (c) *B. pumilus* (d) *B. subtilis* (e) *B. thuringiensis*	1. Non-conjugative plasmids 2. Plasmids and phages whose host range does not include B. cereus, B. anthracis or any other pathogenic strain of Bacillus 3. None (non-vector systems)
		Pseudomonas putida – strain KT 2440	1. Non-conjugative plasmids including certified plasmids: pKT 262, pKT 263, pKT 264 2. None (non-vector systems)
		Streptomyces – specified species: (a) *S. aureofaciens* (b) *S. coelicolor* (c) *S. cyaneus* (d) *S. griseus* (e) *S. lividans* (f) *S. parvulus* (g) *S. rimosus* (h) *S. venezuelae*	1. Non-conjugative plasmids 2. Certified plasmids: SCP2, SLP1, SLP2, PIJ101 and derivatives 3. Actinophage phi C31 and derivatives 4. None (non-vector systems)
		Agrobacterium radiobacter *Agrobacterium rhizogenes* — disarmed strains *Agrobacterium tumefaciens* — disarmed strains	1. Non-tumorigenic disarmed Ti plasmid vectors, or Ri plasmid vectors 2. None (non-vector systems)

1	Bacteria (cont'd)	*Lactobacillus* *Lactococcus lactis* *Oenococcus oeni* syn. *Leuconostoc oeni* *Pediococcus* *Photobacterium angustum* *Pseudoalteromonas tunicata* *Rhizobium* (including the genus *Allorhizobium*) *Sphingopyxis alaskensis* syn. *Sphingomonas alaskensis* *Streptococcus thermophiles* *Synechococcus* – specified strains: (a) PCC 7002 (b) PCC 7942 (c) WH 8102 *Synechocystis* species – strain PCC 6803 *Vibrio cholerae* CVD103-HgR	1. Non-conjugative plasmids 2. None (non-vector systems)
2	Fungi	*Kluyveromyces lactis* *Neurospora crassa* – laboratory strains *Pichia pastoris* *Saccharomyces cerevisiae* *Schizosaccharomyces pombe* *Trichoderma reesei* *Yarrowia lipolytica*	1. All vectors 2. None (non-vector systems)
3	Slime moulds	*Dictyostelium* species	1. *Dictyostelium* shuttle vectors, including those based on the endogenous plasmids Ddp1 and Ddp2 2. None (non-vector systems)
4	Tissue culture	Any of the following if they cannot spontaneously generate a whole animal: (a) animal or human cell cultures (including packaging cell lines); (b) isolated cells, isolated tissues or isolated organs, whether animal or human; (c) early non-human mammalian embryos cultured *in vitro*	1. Non-conjugative plasmids 2. Non-viral vectors, or defective viral vectors unable to transduce human cells 3. Baculovirus (*Autographa californica* nuclear polyhedrosis virus), polyhedrin minus 4. None (non-vector systems)

	Tissue culture (cont'd)	Either of the following if they are not intended, and are not likely without human intervention, to vegetatively propagate, flower or regenerate into a whole plant: (a) plant cell cultures; (b) isolated plant tissues or organs	1. Non-tumorigenic disarmed Ti plasmid vectors, or Ri plasmid vectors, in *Agrobacterium tumefaciens*, *Agrobacterium radiobacter* or *Agrobacterium rhizogenes* 2. Non-pathogenic viral vectors 3. None (non-vector systems)

19.4. **Appendix Four** – Tables 6 and 7

Table 6: Kinds of Dealings suitable for at least NLRD-PC1, unless the Dealing also involves any items from Table 8, which require individual licences, specific to the work, from the OGTR (as per Schedule 3 Part 1 of the Act)

Item	Dealing	Conditions
1.1a	A Dealing involving: a genetically modified laboratory guinea pig OR a genetically modified laboratory mouse OR a genetically modified laboratory rabbit OR a genetically modified laboratory rat	UNLESS: i. an advantage is conferred on the animal by the genetic modification OR ii. the animal is capable of secreting or producing an infectious agent as a result of the genetic modification
1.1c	A Dealing involving: a replication-defective vector derived from *Human adenovirus* or *Adeno-associated* virus in a host mentioned in Item 4 of Table 5	IF THE DONOR NUCLEIC ACID: i. cannot restore replication competence to the vector AND ii. does not: A. confer an oncogenic modification in humans OR B. encode a protein with immunomodulatory activity in humans

Table 7: Kinds of Dealings suitable for at least NLRD-PC2, unless the Dealing also involves any items from Table 8, which require individual licences specific to the work from the OGTR (as per Schedule 3 Part 2 of the Act)

Item	Dealing	Conditions
2.1a	A Dealing involving whole animals (including non-vertebrates)	(i)Involves genetic modification of the genome of the oocyte or zygote or early embryo by any means to produce a novel whole organism AND (ii) DOES NOT involve: a genetically modified laboratory guinea pig OR a genetically modified laboratory mouse OR a genetically modified laboratory rabbit OR a genetically modified laboratory rat OR genetically modified *Caenorhabditis elegans*

Item	Dealing	Conditions
2.1aa	A Dealing involving a genetically modified laboratory guinea pig OR a genetically modified laboratory mouse OR a genetically modified laboratory rabbit OR a genetically modified laboratory rat OR genetically modified *Caenorhabditis elegans*	IF: (i) the genetic modification confers an advantage on the animal AND (ii) the animal is not capable of secreting or producing an infectious agent as a result of the genetic modification
2.1b	A Dealing involving a genetically modified plant	
2.1c	A Dealing involving a host/vector system not mentioned in Table 5 or in Item 1.1(c) of Table 6	AS LONG AS neither host nor vector has been implicated in, or has a history of causing, disease in otherwise healthy: human beings OR animals OR plants OR fungi
2.1d	A Dealing involving a host and vector not mentioned in Table 5	IF: the host or vector has been implicated in, or has a history of causing, disease in otherwise healthy: human beings OR animals OR plants OR fungi AND the donor nucleic acid is characterised AND the characterisation of the donor nucleic acid shows that it is unlikely to increase the capacity of the host or vector to cause harm Example: Donor nucleic acid would increase the capacity of the host or vector to cause harm, if it: (a) provides an advantage or (b) adds a potential host species or mode of transmission or (c) increases its virulence, pathogenicity or transmissibility

Item	Dealing	Conditions
2.1e	A Dealing involving a host/vector system mentioned in Table 5	IF THE DONOR NUCLEIC ACID: encodes a pathogenic determinant OR is uncharacterised nucleic acid from an organism that has been implicated in, or has a history of causing, disease in otherwise healthy: A. human beings OR B. animals OR C. plants OR D. fungi
2.1f	A Dealing involving a host/vector system mentioned in Table 5 AND producing more than 25 litres of GMO culture in each vessel containing the resultant culture	IF: the dealing is undertaken in a facility that is certified by the Regulator as a large scale facility AND the donor nucleic acid satisfies the conditions set out in Item 4 of Table 4
2.1g	A Dealing involving complementation of knocked-out genes	IF: the complementation is unlikely to increase the capacity of the GMO to cause harm compared to the capacity of the parent organism before the genes were knocked out Example: A dealing would not comply with paragraph 2.1g if it involved complementation that, in relation to the parent organism: a. provides an advantage or b. adds a potential host species or mode of transmission or c. increases its virulence, pathogenicity or transmissibility
2.1h	A Dealing involving shot-gun cloning, or the preparation of a cDNA library, in a host/vector system mentioned in Item 1 of Table 5	IF THE DONOR NUCLEIC ACID: is derived from either: a pathogen OR a toxin-producing organism
2.1i	A Dealing involving the introduction of a **replication-defective viral vector** unable to transduce human cells into a host not mentioned in Table 5	IF: the donor nucleic acid cannot restore replication competence to the vector
2.1j	A Dealing involving the introduction of a **replication-defective non-retroviral vector** able to transduce human cells, other than a dealing mentioned in Item 1.1 (c) of Table 6, into a host mentioned in Table 5	IF: the donor nucleic acid cannot restore replication competence to the vector

Item	Dealing	Conditions
2.1k	A Dealing involving the introduction of a **replication-defective non-retroviral vector** able to transduce human cells into a host not mentioned in Table 5	IF: the donor nucleic acid cannot restore replication competence to the vector AND the donor nucleic acid does not: confer an oncogenic modification in humans OR encode a protein with immunomodulatory activity in humans
2.1l	A Dealing involving the introduction of a **replication defective retroviral vector** able to transduce human cells into a host mentioned in Table 5	IF: all viral genes have been removed from the retroviral vector so that it cannot replicate or assemble into a virion without these functions being supplied in trans AND viral genes needed for virion production in the packaging cell line are expressed from independent, unlinked loci with minimal sequence overlap with the vector to limit or prevent recombination AND either: the retroviral vector includes a deletion in the Long Terminal Repeat sequence of DNA that prevents transcription of genomic RNA following integration into the host cell DNA OR the packaging cell line and packaging plasmids express only viral genes *gagpol*, rev and an envelope protein gene, or a subset of these

Item	Dealing	Conditions
2.1m	A Dealing involving the introduction of a **replication defective retroviral vector** able to transduce human cells into a host not mentioned in Table 5	IF: the donor nucleic acid does not: confer an oncogenic modification in humans OR encode a protein with immunomodulatory activity in humans AND all viral genes have been removed from the retroviral vector so that it cannot replicate or assemble into a virion without these functions being supplied in trans AND viral genes needed for virion production in the packaging cell line are expressed from independent, unlinked loci with minimal sequence overlap with the vector to limit or prevent recombination AND either: the retroviral vector includes a deletion in the Long Terminal Repeat sequence of DNA that prevents transcription of genomic RNA following integration into the host cell DNA OR the packaging cell line and packaging plasmids express only viral genes *gagpol*, rev and an envelope protein gene, or a subset of these

19.5. **Appendix Five** – Dealings requiring a Licence

Table 8 – Dealings requiring a Licence (as per Schedule 3 Part 3 of the Act)

Note 1 The following list qualifies the list in Parts 1 and 2 and is not an exhaustive list of dealings that are not Notifiable Low Risk Dealings.

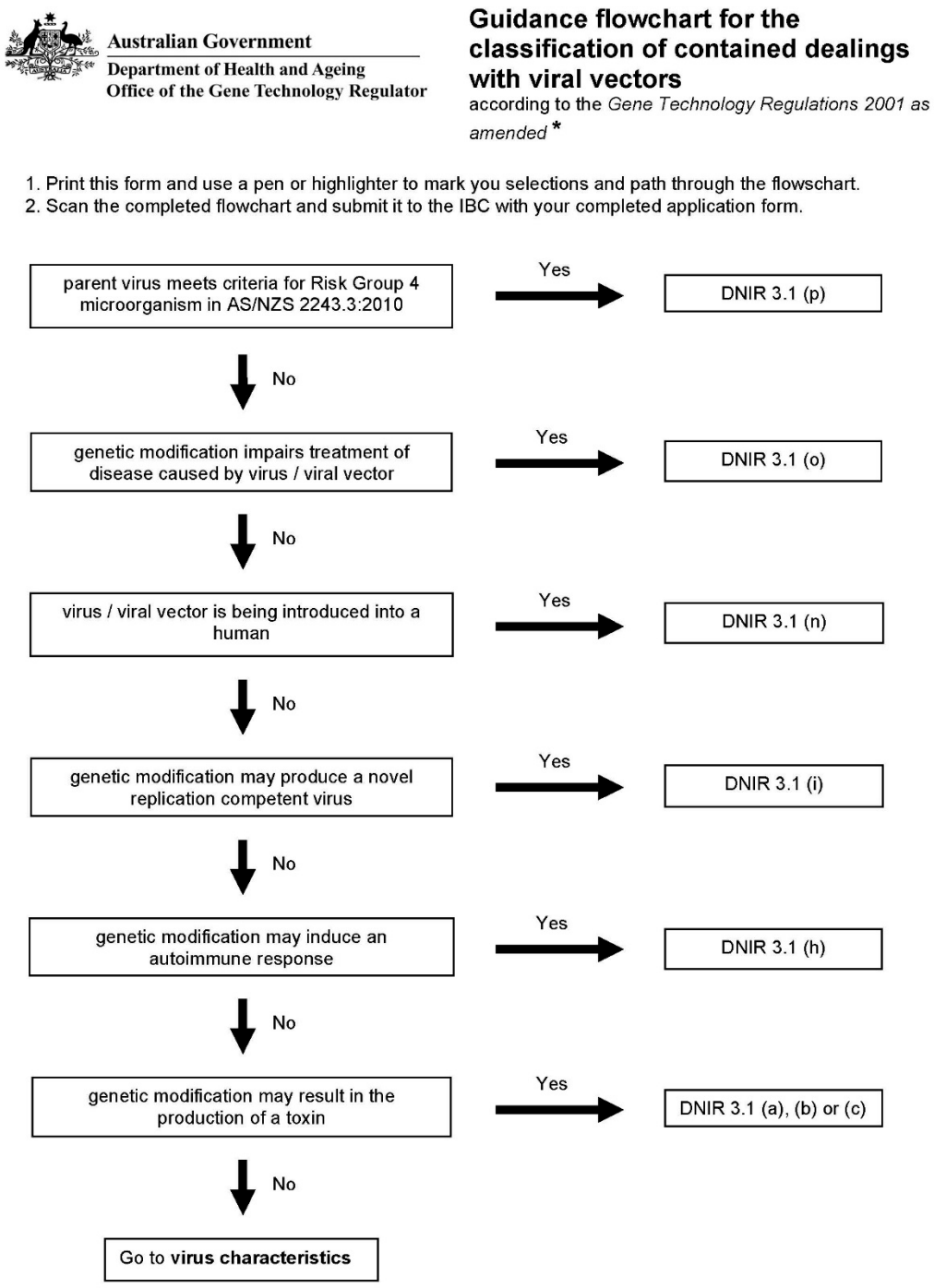
Note 2 A Dealing that is not a Notifiable Low Risk Dealing, or an Exempt Dealing, can be undertaken only by a person who is licensed, under the Act, for the dealing (see Act, section 32).

Item 3.1	Dealing	Conditions
(a)	A dealing involving cloning of nucleic acid encoding a toxin having an LD_{50} of less than 100 μg/kg	Other than a dealing mentioned in paragraph 2.1 (h) of Table 7
(b)	A dealing involving high level expression of toxin genes, even if the LD_{50} is 100 μg/kg or more	
(c)	A dealing involving cloning of uncharacterised nucleic acid from a toxin-producing organism	Other than a dealing mentioned in paragraph 2.1 (h) of Table 7
(d)	A dealing involving the introduction of a replication defective viral vector	INTO A HOST not mentioned in Table 5, other than a dealing mentioned in paragraph 2.1 (i) of Table 7, IF THE DONOR NUCLEIC ACID: (i) confers an oncogenic modification in humans OR (ii) encodes a protein with immunomodulatory activity in humans
(e)	A dealing involving the introduction of a replication competent virus or viral vector	Other than a vector mentioned in Table 5, IF THE DONOR NUCLEIC ACID: (i) confers an oncogenic modification in humans OR (ii) encodes a protein with immunomodulatory activity in humans

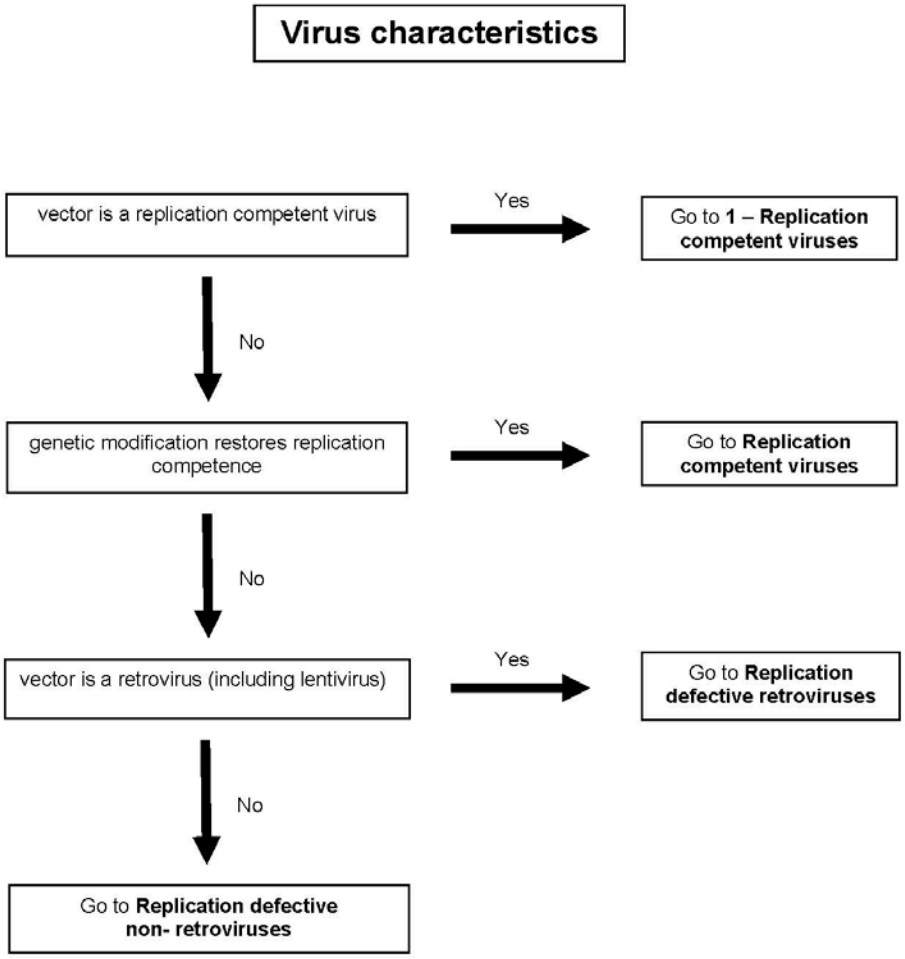
(f)	a dealing involving, as host or vector, a microorganism	IF: (i) the microorganism has been implicated in, or has a history of causing disease in otherwise healthy: (A) human beings OR (B) animals OR (C) plants OR (D) fungi AND (ii) NONE of the following sub-subparagraphs apply: (A) the host/vector system is a system mentioned in Table 5 (B) the donor nucleic acid is characterised and its character shows that it is unlikely to increase the capacity of the host or vector to cause harm (C) the dealing is mentioned in paragraph 2.1 (g) of Table 7 *Example* *Donor nucleic acid would not comply with sub-subparagraph (B) if, in relation to capacity of the host or vector to cause harm, it:* *(a) provides an advantage; or* *(b) adds a potential host species or mode of transmission; or* *(c) increases its virulence, pathogenicity or transmissibility.*
(g)	A dealing involving the introduction, into a microorganism, of nucleic acid encoding pathogenic determinant	UNLESS: (i) the dealing is a dealing mentioned in paragraph 2.1 (g) of Table 7 OR (ii) the microorganism is a host mentioned in Table 5
(h)	A dealing involving the introduction, into a microorganism, genes whose expressed products are likely to increase the capacity of the microorganism to induce an autoimmune response	Other than a host mentioned in Table 5
(i)	A dealing involving use of a viral or viroid genome, or fragments of a viral or viroid genome, to produce a novel replication competent virus with an increased capacity to cause harm compared to the capacity of the parent or donor organism	*Example* *A dealing would comply with paragraph (i) if it produces a novel replication competent virus that has a higher capacity to cause harm to any potential host species than the parent organism because the new virus has:* *(a) an advantage; or* *(b) a new potential host species or mode of transmissibility; or* *(c) increased virulence, pathogenicity or transmissibility.*

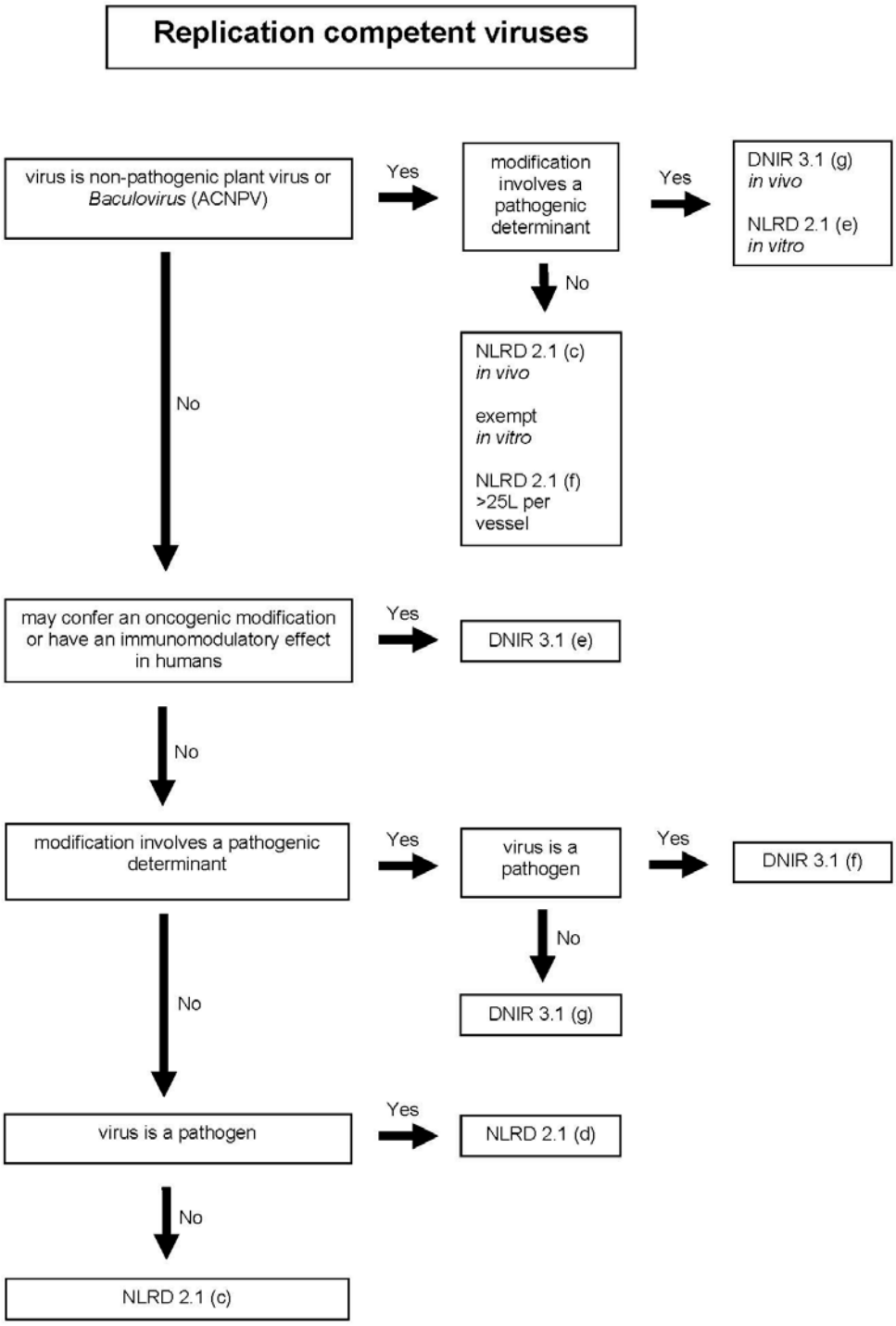
(j)	A dealing with a replication defective retroviral vector (including a lentiviral vector) able to transduce human cells	Other than a dealing mentioned in paragraph 2.1 (l) or (m) of Table 7
(k)	A dealing involving a genetically modified animal, plant or fungus that is capable of secreting or producing infectious agents as a result of the genetic modification	
(l)	A dealing producing, in each vessel containing the resultant GMO culture, more than 25 litres of that culture	Other than a dealing mentioned in paragraph 2.1 (f) of Table 7
(m)	A dealing that is inconsistent with a policy principle issued by the Ministerial Council	
(n)	A dealing involving the intentional introduction of a GMO into a human being	UNLESS the GMO: (i) is a human somatic cell AND (ii) cannot secrete or produce infectious agents as a result of the genetic modification AND (iii) if it was generated using viral vectors: (A) has been tested for the presence of viruses likely to recombine with the genetically modified nucleic acid in the somatic cells AND (B) the testing did not detect a virus mentioned in sub-subparagraph (A) AND (C) the viral vector used to generate the GMO as part of a previous dealing is no longer present in the somatic cells
(o)	A dealing involving a genetically modified pathogenic organism	IF the practical treatment of any disease or abnormality caused by the organism would be impaired by the genetic modification
(p)	A dealing involving a microorganism that satisfies the criteria in AS/NZS 2234.3:2010 for classification as Risk Group 4	

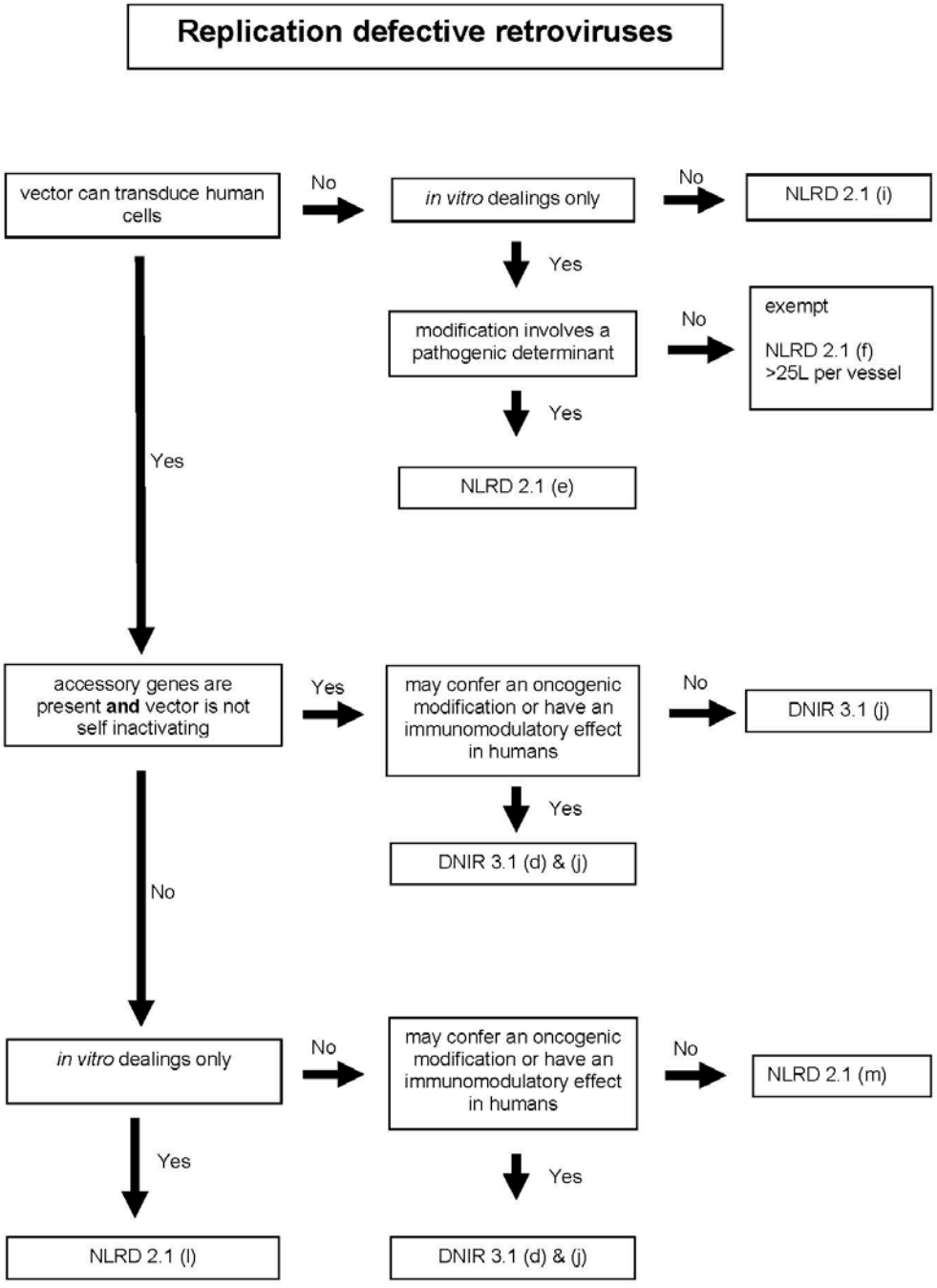
19.6. **Appendix Six** – Viral Vector Flow Chart

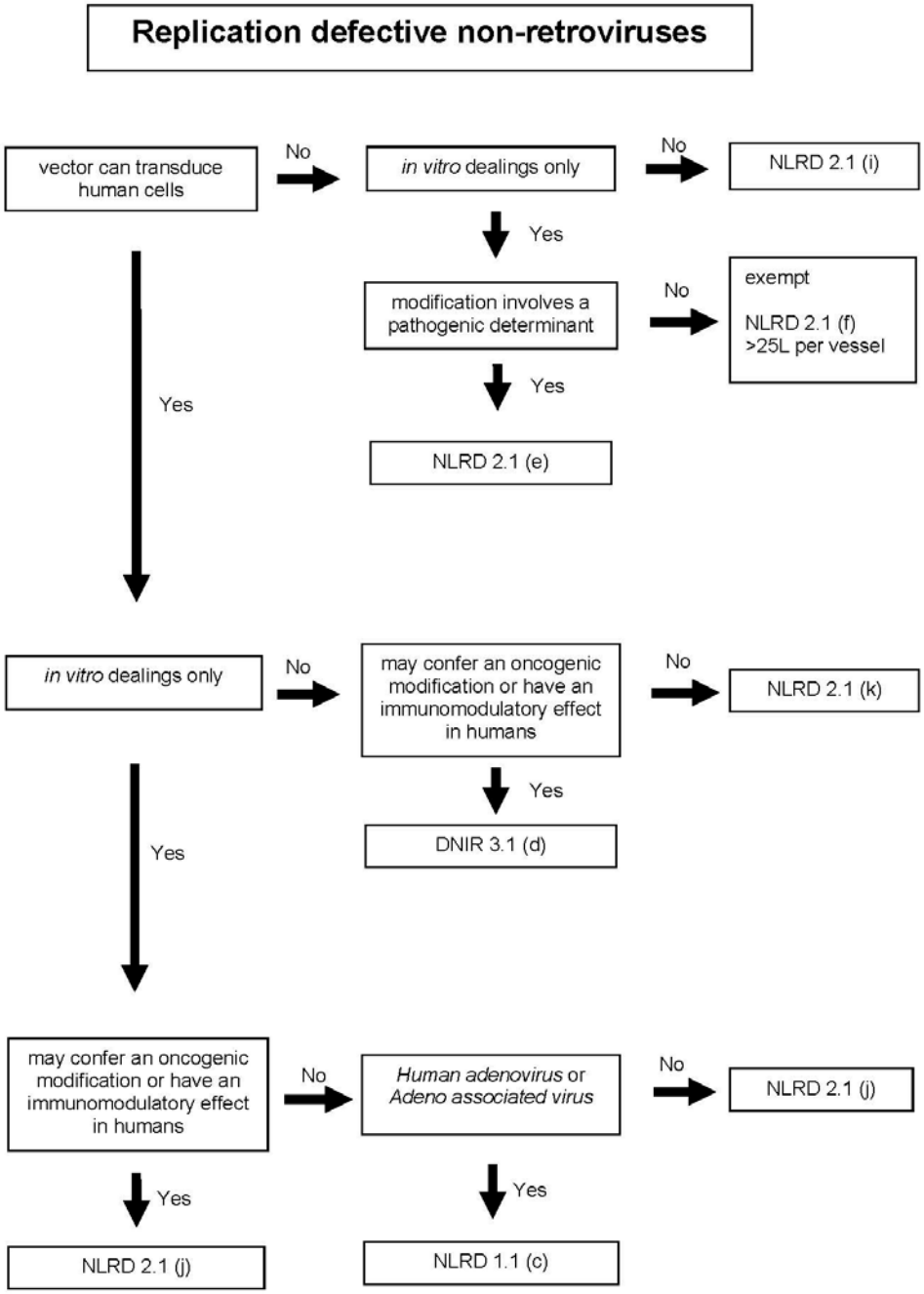


* Effective from 1 September 2011, incorporating amendments up to the *Gene Technology Amendment Regulations 2011 (No. 1)*. This table provides guidance only and does not constitute legal advice. Users must refer to the complete applicable conditions and exclusions in the *Gene Technology Regulations 2001*, as amended.


Virus characteristics
vector is a replication competent virus
Yes
Go to 1 – Replication competent viruses
No
genetic modification restores replication competence
Yes
Go to Replication competent viruses
No
vector is a retrovirus (including lentivirus)
Yes
Go to Replication defective retroviruses
No
Go to Replication defective non- retroviruses


Replication competent viruses
virus is non-pathogenic plant virus or *Baculovirus* (ACNPV)
Yes
modification involves a pathogenic determinant
Yes
DNIR 3.1 (g)
in vivo
NLRD 2.1 (e)
in vitro
No
NLRD 2.1 (c)
in vivo
exempt
in vitro
NLRD 2.1 (f)
>25L per vessel
No
may confer an oncogenic modification or have an immunomodulatory effect in humans
Yes
DNIR 3.1 (e)
No
modification involves a pathogenic determinant
Yes
virus is a pathogen
Yes
DNIR 3.1 (f)
No
DNIR 3.1 (g)
No
virus is a pathogen
Yes
NLRD 2.1 (d)
No
NLRD 2.1 (c)


Replication defective retroviruses
vector can transduce human cells
No
in vitro dealings only
No
NLRD 2.1 (i)
Yes
modification involves a pathogenic determinant
No
exempt
NLRD 2.1 (f)
>25L per vessel
Yes
NLRD 2.1 (e)
Yes
accessory genes are present and vector is not self inactivating
Yes
may confer an oncogenic modification or have an immunomodulatory effect in humans
No
DNIR 3.1 (j)
Yes
DNIR 3.1 (d) & (j)
No
in vitro dealings only
No
may confer an oncogenic modification or have an immunomodulatory effect in humans
No
NLRD 2.1 (m)
Yes
NLRD 2.1 (l)
Yes
DNIR 3.1 (d) & (j)


Replication defective non-retroviruses
vector can transduce human cells
No
in vitro dealings only
No
NLRD 2.1 (i)
Yes
modification involves a pathogenic determinant
No
exempt
NLRD 2.1 (f)
>25L per vessel
Yes
NLRD 2.1 (e)
Yes
in vitro dealings only
No
may confer an oncogenic modification or have an immunomodulatory effect in humans
No
NLRD 2.1 (k)
Yes
DNIR 3.1 (d)
Yes
may confer an oncogenic modification or have an immunomodulatory effect in humans
No
Human adenovirus or Adeno associated virus
No
NLRD 2.1 (j)
Yes
Yes
NLRD 2.1 (j)
NLRD 1.1 (c)