Environmental Protection Authority
Te Mana Rauhī Taiao

DECISION

Date	16 April 2019
Application codes	APP202708
Application type	To develop any new organism in containment under section 40(1) of the Hazardous Substances and New Organisms Act 1996
Applicant	University of Auckland
Date application received	8 March 2019
Consideration date	16 April 2019
Considered by	A decision-making committee of the Environmental Protection Authority (the Committee)[1]: • Dr Derek Belton (Chair) • Dr Ngaire Phillips • Dr Sharon Lehany
Purpose of the applications	To develop in containment genetically modified organisms for research and teaching purposes.

1. Summary of decision

1.1. Application APP202708 to develop in containment genetically modified organisms (GMOs) for research and teaching purposes was lodged under section 40(1) of the Hazardous Substances and New Organisms Act 1996 (the Act).

1.2. The application was considered in accordance with the relevant provisions of the Act and the HSNO (Methodology) Order 1998 (the Methodology).

1.3. The Committee **approved** the application to develop the new organisms (as described in Tables 1 and 2) in accordance with section 45(1)(a) of the Act, subject to the controls set out in Appendix 1.

[1] The Committee referred to in this decision is the subcommittee that has made the decision on the application under delegated authority in accordance with section 18A of the Act.

2. Application process

Application Receipt

2.1. Application APP202708 was formally received for processing on 8 March 2019.

Public notification

2.2. Section 53(2) of the Act provides that an application under section 40 of the Act may be publicly notified by the Environmental Protection Authority (EPA) if it considers that there is likely to be significant public interest.

2.3. The applications were not considered to meet the threshold of significant public interest because the new organisms all conform to standard low-risk categorisations, and all research and teaching involving the new organisms will be conducted within containment facilities.

Comments from Ministry for Primary Industries and Department of Conservation

2.4. In accordance with section 58(1)(c) of the Act, EPA staff advised the Ministry for Primary Industries (MPI), and the Department of Conservation (DOC) of the applications, and invited them to provide information and/or comment.

2.5. DOC considered the development in containment of low-risk GMOs carries very low risk to biodiversity. Therefore, they were not opposed to approval of this application.

2.6. MPI did not respond.

Consideration period

2.7. The consideration of the applications by the Committee commenced on 11 April 2019 and concluded on 16 April 2019.

Information available for the consideration

2.8. The information available for the consideration comprised;

- the application and appendices;
- EPA staff advice (provided under section 58(1)(a) of the Act; includes MPI and DOC comments);

2.9. The Committee considered that it had sufficient information to assess the application.

Legislative criteria for the applications

2.10. Application APP202708 was not considered under sections 42A and 42B of the Act as some of the proposed modifications did not meet the criteria of the Hazardous Substances and New Organisms (Low-Risk Genetic Modifications) Regulations 2003 (hereafter, the Low-Risk Regulations). Consequently, the Committee considered the application in accordance with section 45 of the Act, taking into account the matters specified in sections 37, 39, 43, Schedule 3 (Parts 1 and 2), the relevant matters in Part 2 of the Act, and the Methodology.

3. Purpose of the application

3.1. Application APP202708 was submitted for the development in containment of the following GMOs (as described in Tables 1 and 2), for research and teaching purposes:

- genetically modified risk group 1 and 2 microorganisms;
- genetically modified plant cells and tissues including protoplasts, cultured cells, and tissue derived from Angiospermae (flowering plants);
- genetically modified animal cell lines, tissues and organoids (including immortalised and primary cells) from the Kingdom Animalia, including the Phyla Arthropoda, Chordata and Euarthropoda. Animal cell lines may include induced pluripotent stem cell lines and embryonic stem cell lines;
- genetically modified human cell lines, tissues and organoids (including immortalised and primary cells). Human cell lines may include induced pluripotent stem cell lines, but will not include human embryonic stem cell lines;
- genetically modified whole animals *Mus musculus* (mouse), *Rattus norvegicus* (Norway rat), *Rattus rattus* (black rat), *Drosophila melanogaster* (fruit fly), *Caenorhabditis elegans* (roundworm), *Dugesia japonica*, *Dugesia dorotocephala*, *Schmidtea mediterranea*, *Neppia montana* (flatworms), *Ovis aries* (sheep), *Gallus domesticus* (chicken), *Gallus gallus* (red jungle fowl), *Danio rerio* (zebrafish), *Xenopus laevis* (African clawed frog); and
- genetically modified whole plants *Actinidia deliciosa* (kiwifruit), *A. chinensis* (kiwifruit), *Allium cepa* (onion), *Asplenium bulbiferum* (chicken fern), *Asplenium flabellifolium* (butterfly fern), *Arabidopsis thaliana* (Mouse-ear cress, arabidopsis), *Arachis hypogaea* (peanut), *Brachypodium distachyon* (brome), *Brassica napus* (canola), *Brassica rapa* (turnip rape), *Capsicum annuum* (capsicums and chiles), *Carica papaya* (papaya, pawpaw), *Cicer arietinum* (chickpea), *Daucus carota* (carrot), *Gillenia trifoliata* (Bowman's root), *Glycine max* (soybean), *Lens culinaris* (lentil), *Lolium multiflorum* (ryegrass), *Lolium perenne* (ryegrass), *Lotus corniculatus* (birdsfoot trefoil), *Malus domestica* (apple), *Medicago arabica* (heart clover), *Medicago minima* (little bur-clover), *Medicago sativa* (alfalfa), *Medicago truncatula* (barrel medic), *Nicotiana benthamiana*, *Nicotiana tabacum* (tobacco), *Physcomitrella patens* (spreading earthmoss), *Oryza sativa* (rice), *Persea americana* (avocado), *Physalis ixocarpa* (tomatillo), *Physalis peruviana* (cape gooseberry), *Physalis pruinosa* (ground cherry), *Pisum sativum* (pea), *Solanum betaceum* (tamarillo), *Solanum lycopersicum* (tomato), *Solanum melongena* (eggplant), *Solanum muricatum* (pepino), *Solanum tuberosum* (potato), *Solanum quitoense* (naranjilla), *Swainsona formosa* (Stuart's desert pea),*Trifolium incarnatum* (crimson clover), *Trifolium occidentale* (western clover), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *Trigonella foenum-graecum* (fenugreek), *Vasconcellea spp.* (mountain papaya), and *Zea mays* (maize, corn).
- Developments of *Ovis aries*, *Gallus domesticus*, *Gallus gallus*, and *Xenopus laevis* via genetic modification are conditional, and cannot be carried out until the approval holder provides a suitable containment facility for the organisms, that is approved for use by MPI.

3.2. Section 45(1)(a)(i) of the Act requires that the applications be for one of the purposes specified in section 39(1) of the Act.

3.3. The Committee was satisfied the applications are for valid purposes those being such other purposes as the Authority thinks fit, ie, research and teaching, as provided for in section 39(1)(h) of the Act.

4. Adequacy of containment and controls imposed

4.1. Section 45(1)(a)(iii) of the Act requires that the Committee be satisfied that the new organisms (as described in Tables 1 and 2) can be adequately contained.

4.2. To evaluate the adequacy of containment, the Committee assessed the potential for the new organisms to escape from containment taking into account:

- the biological characteristics of the proposed new organisms that relate to containment;
- the containment regime; and
- the potential pathways of escape of the new organisms from the containment facility.

Biological characteristics of the new organisms that relate to containment

4.3. The Committee noted that all the organisms proposed to be developed under this approval meet the requirements for the Low-Risk Regulations. All these host organisms meet the Category 1/2 host organisms' description[2].

4.4. The Committee also noted that all but thirteen of the host organisms (*Dugesia japonica, Dugesia dorotocephala, Schmidtea mediterranea*, *Neppia montana, Asplenium bulbiferum, Asplenium flabellifolium, Arachis hypogaea, Physalis ixocarpa*, *Physalis peruviana, Physalis pruinosa*, *Solanum quitoense*, *Swainsona formosa*, and *Trifolium incarnatum*) have previously been assessed in various containment and development approvals under the HSNO Act. The biological characteristics of low-risk host organisms are such that these organisms have limited ability to escape containment facilities.

4.5. The Committee concluded all the proposed host organisms exhibit biological characteristics that are consistent with low-risk host organisms.

4.6. The Committee noted that the GMOs to be developed will not contain modifications that increase the pathogenicity, virulence or infectivity of the host organism to laboratory personnel, the community or the environment; or modifications that increase the ability of the host organism to escape from containment (as described in Tables 1 and 2).

The containment regime

4.7. Controls 1-24 (Appendix 1) were imposed by the Committee to address containment. These controls address the matters detailed in Schedule 3 (Parts 1 and 2) of the Act. These provisions address;

- the construction and maintenance of the facility and equipment;
- management, identification and security;

[2] Category 1 or 2 host organisms as defined in the HSNO (Low-Risk Genetic Modification) Regulations 2003.

- access for personnel and equipment;
- laboratory and inspection procedures;
- transport, identification and packaging of material leaving the facility;
- registers and documentation;
- treatment of waste (solids, liquids and air);
- contingency plans; and
- staff training.

4.8. Additional controls 25-26 (Appendix 1) were imposed by the Committee to address containment of *Ovis aries*, *Gallus domesticus*, *Gallus gallus*, and *Xenopus laevis.*

4.9. All containment facilities are initially inspected, approved and regularly audited by MPI for compliance with the controls of this approval.

4.10. The Committee noticed that the applicant has established its own Biological Risk Management and Containment Standard in response to outcome-based controls of the HSNO approvals. The University of Auckland Biological Risk Management and Containment Standard has a procedural framework of 22 expert user guidelins (Appendix 2 of the application form), a Quick Reference Guide and facility-specific manuals for microorganisms, rodents, invertebrates, zebrafish and plants, that set out how processes are to be undertaken.

4.11. The Committee noted that each containment facility will be operated in agreement with the applicant's Biological Risk Management and Containment Standard and its guidelines. These documents will be reviewed according to control 3. MPI reviews the User Guidelines as part of the approval process of the containment facility.

Potential pathways of escape of the new organisms from containment

4.12. The following potential pathways of escape were identified and addressed by the imposed controls;

- escape during transport to/between containment facilities;
- escape via unauthorised persons being present within the containment facility;
- escape in waste or on contaminated equipment;
- escape due to the presence of undesirable organisms (e.g. vermin);
- unintentional escape via laboratory personnel;
- escape via failure of the containment regime through inadequate maintenance/upkeep; and
- escape via failure of containment regime following fire or natural disaster.

Escape during transport to/between containment facilities

4.13. Escape during transport to or between containment facilities was identified as a potential pathway for escape. The Committee imposed controls 12-13 to specify requirements for moving the new organisms to or between containment facilities, including maintaining containment and accompanying documentation.

Escape via unauthorised persons being present within the containment facility

4.14. Unauthorised persons were identified as providing a potential pathway of escape as they may deliberately or accidentally remove the new organisms from the containment facility. The Committee imposed controls 14-16 to specify requirements for access to the facility, including the requirements to exclude unauthorised persons, and the identification of entrances.

Escape in waste or on contaminated equipment

4.15. The removal of waste and contaminated equipment from the facility was identified as a potential pathway of escape. The Committee imposed controls 17 and 18 to specify requirements for removing equipment (including personal protective equipment) and waste from the containment facility to prevent the escape of the new organisms. The Committee noted that when waste is treated off-site (to kill any approved organism or heritable material), the new organisms must be contained during transport to the treatment location.

Escape due to the presence of undesirable organisms in the facility

4.16. The presence of undesirable organisms, such as vermin, was identified as a possible pathway of escape. The Committee imposed control 19 to require the containment facility to be secured and monitored to ensure the exclusion of undesirable organisms that might compromise the containment of the new organisms.

Escape via laboratory personnel

4.17. The Committee noted that control 2 requires the University of Auckland to ensure all laboratory personnel comply with the controls of this approval. Accidental/unintentional removal of the new organisms by laboratory personnel was identified as a potential pathway of escape. The Committee imposed control 7 to require persons entering and exiting the containment facility to do so in a way that does not compromise containment. The Committee imposed control 20 to require that any person entering the containment facility has sufficient training on the containment regime that they are able to meet their responsibilities.

Escape via inadequate maintenance or failure of containment measures

4.18. Escape as a result of failure of the containment regime through inadequate maintenance of the regime was identified as a potential pathway of escape. The Committee imposed control 6 to require the containment facility to be designed, constructed and maintained to prevent the new organisms from escaping. The Committee imposed control 23 to require the containment measures to be inspected, monitored and reviewed to ensure that containment is being achieved. Control 23 also requires that containment measures be inspected as soon as possible after any event that could compromise containment.

Escape via failure of containment regime following fire or natural disaster

4.19. Escape as a result of failure of the containment regime following fire or natural disaster has also been identified as a potential pathway of escape. The Committee imposed control 23 to require the containment facility to be inspected as soon as possible after any event that could compromise containment – including fire, acts of God (such flood, earthquake, tornado), or attempts to break into the facility.

Conclusion on adequacy of the containment regime

4.20. The Committee concluded that it was highly improbable that the new organisms could escape from containment, taking into account the;

- biological characteristics of the new organisms that relate to containment;
- containment controls; and
- potential pathways of escape of the new organisms from the containment facilities.

4.21. Therefore, the Committee concluded that the new organisms could be adequately contained. In particular, the Committee was satisfied that the controls imposed in Appendix 1 provide for each of the applicable matters specified in Schedule 3 (Parts 1 and 2) of the Act (as required under section 45(2) of the Act).

4.22. While section 45(2) also provides that an approval may include controls that provide for any other matters in order to give effect to the purpose of the Act, the Committee considered that no additional controls were required to achieve the purpose of the Act.

5. Effects of the organism and any inseparable organism

5.1. The Committee is required by section 45(1)(a)(ii) of the Act to take into account all the effects of the organism and any inseparable organism, and consider whether the beneficial effects of having the organism in containment outweigh the adverse effects of the organism and any inseparable organism.

Effects of any inseparable organism

5.2. The Committee did not identify any inseparable organisms.

The ability to establish an undesirable self-sustaining population and the ease of eradication

5.3. Section 37 the Act requires the Committee to have regard to the ability of the organism to establish an undesirable self-sustaining population, and the ease with which the organism could be eradicated if it established an undesirable self-sustaining population.

5.4. The Committee recognised that the new organisms have differing potential to form self-sustaining populations in the New Zealand environment. However, the potential for these new organisms to escape from containment and then form undesirable self-sustaining populations is limited by the containment regime.

5.5. The Committee noted that control 6 requires the containment facility must be designed, constructed, managed, and maintained to prevent the approved organism(s) from escaping.

5.6. The Committee noted that control 11 required that MPI must be notified as soon as possible, and within 24 hours, of any escape and/or breach of containment and the actions taken in response to that incident.

5.7. The Committee noted that controls 21 and 22 require contingency plans be documented for all approved organisms, and the implementation of those plans in the event of a breach of containment.

5.8. The Committee considered that in the highly improbable event of escape, a self-sustaining population of unmodified Risk Group 1 and 2 microorganisms could establish if they were to encounter a suitable environmental niche; however, this is considered unlikely as many of the microorganisms will be laboratory-adapted strains. The Committee noted that it would be difficult to identify such a population because it would be very similar to the existing micro-flora in the New Zealand environment. Consequently, it is unlikely that an undesirable self-sustaining population of unmodified Risk Group 1 and 2 microorganisms could be eradicated.

5.9. The Committee noted that GM microorganisms that potentially have a greater ability to escape from containment than the unmodified host organism will not be developed under application APP202708. Further, the Committee also noted that modifications that result in GM Risk Group 2 microorganisms gaining resistance to antibiotics used for clinical, veterinary, agricultural or horticultural treatment of infections caused by a host organism will not be developed. This means that, should GM Risk Group 2 microorganisms escape containment, isolated populations (ie, infections) are potentially eradicable with treatment. However, in the event that an undesirable self-sustaining population of GM microorganisms did establish, it may be difficult to eradicate such a microbial population.

5.10. The Committee recognised that unmodified and genetically modified plant and animal (including human) cells/cell lines rely on specific laboratory culture conditions for survival. Accordingly, the Committee considered that in the highly unlikely event of cells escaping containment, it is highly improbable that the cells/cell lines will survive and establish self-sustaining populations.

5.11. The Committee noted that many of the GM animals to be developed are highly inbred strains and are poorly adapted to survive without human intervention. Accordingly, escaped GM animal strains are unlikely to survive outside a containment facility, and even less likely to establish a self-sustaining population.

5.12. The Committee noted that the natural aquatic environment of *Xenopus laevis* (African clawed frog) ranges between 16 - 26° C[3], and *Danio rerio* (zebrafish) are mostly maintained in the room temperature or the tank temperature of 26 - 28.5° C. Therefore, in the highly unlikely event that these organisms were to escape containment, it is highly unlikely that they would encounter a suitable aquatic environment that would support a self-sustaining population.

[3] Low elevation streams and rivers in New Zealand typically fluctuate within a 10 – 20°C temperature range (APP201982).

5.13. The Committee noted that the likelihood of the modified plants (or seed or pollen) escaping from containment is low due to the nature of containment.

Assessment of adverse effects

5.14. The Committee considered the potential adverse effects of the new organisms on human health and safety, the environment, society and the community, Māori culture and traditions, the principles of the Treaty of Waitangi and the market economy.

5.15. When considering the adverse effects of the new organisms, the Committee took into account the adverse effects (if any) of having the new organisms in containment, the probability that the new organisms may escape containment after considering all the controls to which the new organisms would be subject to if the applications were approved, and the effects of the new organisms if they were to escape (section 45(4) of the Act).

Effects on the environment

5.16. The Committee considered the information provided on potential effects on the environment, and noted that all research involving the new organisms will be conducted in MPI-approved containment facilities. The containment will be managed according to the University of Auckland Biological Risk Management and Containment Standard, and its developed guidelines and references detailed on how the imposed controls (Appendix 1) will be met.

5.17. The Committee noted that modifications that increase the pathogenicity, virulence or infectivity of the host organism to laboratory personnel, the community or the environment, and modifications that increase the ability of the host organism to escape from containment, are excluded.

5.18. The Committee noted that for any adverse effects on the environment to occur, the new organisms would first need to escape or be released from containment. The Committee considered that it was highly improbable that such an adverse effect would eventuate taking into account the imposed controls.

5.19. After assessing all the information, the containment controls imposed, and the likelihood of escape from containment, the Committee did not identify any non-negligible adverse effects on the environment from the development of the new organisms in containment.

Effects on human health and safety

5.20. The Committee noted that as the new organisms to be developed do not under normal circumstances infect or cause disease in humans, they are unlikely to pose a serious risk to laboratory personnel or the wider community.

5.21. The Committee acknowledged that laboratory personnel working with the new organisms are potentially at risk of allergic or toxic reactions to the organisms, or injuries caused by the organisms (bites, cuts from claws etc.); however, personnel will be trained to safely handle the new organisms, and direct exposure will be limited by the controls proposed, personal protective equipment and good

laboratory practices. Furthermore, all manipulations that involve Risk Group 2 microorganisms that are likely to form aerosols, or Risk Group 1 and 2 microorganisms that form spores will be performed in Biological Safety Cabinets.

5.22. The Committee recognised that unintended exposure to microorganisms of a higher risk grouping (i.e. zoonotic diseases), and cell lines that contain increased risk factors (i.e. infectious particles) introduces additional risk to laboratory personnel. However, these risks will be limited by; performing all open container manipulations of animal, plant or environmental samples that contain unidentified mixed cultures or microorganisms within a Class II Biological Safety Cabinet, sealed glove box or anaerobic hood in accordance with The University of Auckland's Biological Risk Management and Containment Expert User Guidelines.

5.23. Further, the Committee considered it was highly improbable that adverse effects on human health will occur taking into account the imposed controls.

5.24. After assessing all the information, the Committee did not identify any non-negligible adverse effects on human health and safety that may result from the import and/or development of the new organisms in containment.

Effects on Māori and their culture and traditions and the principles of the Treaty of Waitangi (Te Tiriti o Waitangi)

5.25. The Committee took into account the effects on the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, valued flora and fauna, and other taonga, and the principles of the Treaty of Waitangi.

5.26. The University of Auckland consulted with the Ngāti Whātua iwi representative on their delegated UABSC, and also another UABSC member who advises on matters of general importance to Māori with regard to this application. No concerns about the use of the applications were raised.

5.27. Kaupapa Kura Taiao, the Authority's Māori advisory group, carried out a cultural risk assessment on this application. They found that overall, any concerns that Māori may have about this proposal are outweighed by its benefits.

5.28. The Committee considered that the new organisms would first need to escape from containment to cause adverse effects on the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, valued flora and fauna, and other taonga, and the principles of the Treaty of Waitangi. The Committee considered that the imposed containment controls were sufficient to contain the new organisms, and considered the likelihood of escape as highly unlikely.

5.29. After assessing all the information, the Committee did not identify any non-negligible adverse effects on the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, valued flora and fauna, and other taonga from the development of the new organisms in containment.

5.30. Given the absence of identified effects to the outcomes of significance to iwi/Māori, the Committee considered the application to be broadly consistent with the principles of the Treaty of Waitangi.

Effects on the market economy and society and community

5.31. The Committee took into account the effects of the new organisms on the market economy and society and community. The Committee noted that the new organisms will be held in containment facilities in accordance with the University of Auckland Biological Risk Management and Containment Standard, as well as its developed guidelines and references detailed on how the imposed controls (Appendix 1) will be met.

5.32. The Committee noted that all but 13 of the host organisms proposed to be developed under this approval (as described in Tables 1 and 2) have previously been assessed under the Act. The Committee noted that all, including those 13 host organisms, meet the requirements of the Low-Risk Regulations.

5.33. The Committee also noted that prohibiting modifications that increase the pathogenicity, virulence or infectivity of the host organism to laboratory personnel, the community or the environment, and modifications that increase the ability of the host organism to escape from containment, is consistent with many existing approvals for development in containment.

5.34. Furthermore, for any adverse effects on the market economy or society or communities to occur, the new organisms would need to escape or be released from containment. The Committee considered that it was highly improbable that an escape could occur, taking into account the imposed controls.

5.35. Therefore, the Committee concluded that the new organisms under this approval (as described in Tables 1 and 2) are not expected to cause greater potential adverse effects on the market economy or society and communities than the organisms currently held in containment facilities under other HSNO approvals.

Conclusion on assessment of adverse effects

5.36. After considering the information provided, the Committee did not identify any non-negligible adverse effects of the development in containment of the new organisms. Therefore, the Committee considered that any adverse effects would be negligible.

5.37. Since the Committee did not identify any non-negligible adverse effects from the development in containment of the new organisms, the Committee was not required to take into account the probability of occurrence or magnitude of any adverse effects.

Assessment of beneficial effects

5.38. The Committee considered the potential beneficial effects on human health and safety, the environment, society and community, Māori culture and traditions, and the market economy from the development in containment of the new organisms.

5.39. The Committee identified the following potential beneficial effects of developing the new organisms in containment under the broad purpose of research and teaching, and one consistent set of containment controls:

- increased understanding in many areas of biology, molecular biology, microbiology, plant biology, and genetics. The continued study and the use of the new organisms developed under this approval is critical for, including but not limited to, fundamental biological and biomedical research in New Zealand, and will lead to valuable innovation in New Zealand's biomedical, biotechnology and agricultural sectors
- benefits to the local economy through the possible commercialisation of the innovations
- simplification of internal and external auditing processes that ensure compliance with containment controls.

5.40. The Committee considered that ongoing gains in scientific knowledge in many areas of biology and increased awareness of biosafety and containment controls within the applicant's research facililty will be of moderate benefit to New Zealand. The Committee noted that the applicant has a proven track record for producing quality scientific research and containment systems, and considered that it was highly likely that these benefits would eventuate. Therefore these beneficial effects were considered to be non-negligible.

Conclusion on assessment of beneficial effects

5.41. After considering the information provided, the Committee considered that the beneficial effects would be non-negligible.

6. Overall evaluation and weighing of beneficial and adverse effects

6.1. The Committee considered that they had sufficient information to weigh the effects of the development of the new organisms in containment.

6.2. Overall, the Committee did not identify any non-negligible adverse effects from the development of the new organisms in containment.

6.3. Given that there were no non-negligible adverse effects identified, consideration of whether the adverse effects may aggregate in order to assess any cumulative effects was not relevant.

6.4. The Committee concluded that the beneficial effects accruing from the development of the new organisms in containment were non-negligible.

6.5. Therefore, the Committee considered the beneficial effects of the development of the new organisms in containment outweighed the adverse effects.

6.6. Section 6(f) of the Act requires the Committee to take into account New Zealand's international obligations when determining the applications. New Zealand has no obligations which are relevant to this approval.

6.7. The Committee, having considered all the effects of the new organisms and the matters outlined in section 45 of the Act, concluded that;

a) the applications were for one of the purposes specified in section 39(1);

b) the approved organisms could be adequately contained; and

c) the beneficial effects of developing the new organisms in containment outweighed the adverse effects of the approved organisms.

7. Achieving the purpose of the Act

7.1. The purpose of the Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms (section 4 of the Act).

7.2. In order to achieve the purpose of the Act, when considering these applications the Committee recognised and provided for the following principles (section 5 of the Act);

a) the safeguarding of the life-supporting capacity of air, water, soil and ecosystems; and

b) the maintenance and enhancement of the capacity of people and communities to provide for their own economic, social and cultural well-being and for the reasonably foreseeable needs of future generations.

7.3. The Committee took into account the following matters when considering these applications in order to achieve the purpose of the Act (sections 6, 7 and 8 of the Act), and the Committee did not identify any such risk, cost, benefit or other impact;

- the safeguarding of the life-supporting capacity of air, water, soil, and ecosystems;
- the sustainability of all native and valued introduced flora and fauna;
- the intrinsic value of ecosystems;
- public health;
- the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, valued flora and fauna, and other taonga;
- the economic and related benefits and costs of using the new organisms;
- New Zealand's international obligations;
- the need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects; and
- the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

7.4. The Committee was satisfied that this approval is consistent with the purpose of the Act and the above principles and matters under the Act and the Methodology. Any substantive issues arising from the legislative criteria have been discussed in the preceding sections of this approval.

8. Associated approvals

8.1. The Committee noted that the approval granted under this decision does not affect the requirements of the Biosecurity Act 1993, including any authorisations or approvals that may be required under that Act (such as ongoing approval of containment facilities and manuals by MPI).

9. Decision

9.1. After reviewing all the information contained in the applications, the Committee was satisfied that the applications met the requirements of section 40 of the Act.

9.2. The Committee considered that the threshold for approval under section 45 of the Act has been met. It was satisfied that the organisms could be adequately contained and that the beneficial effects of the new organisms outweighed the adverse effects of the new organisms, taking into account all of the following:

- all the effects of the new organisms;
- the matters in section 39, 43, 45, and Schedule 3 (Parts 1 and 2) of the Act;
- the relevant matters in Part 2 of the Act; and
- the Methodology.

9.3. The Committee decided to exercise its discretion and approve the development in containment of the new organisms described in Tables 1 and 2 under section 45(1)(a) of the Act. The Committee noted that in accordance with section 45(2) of the Act, the approval has been granted with controls (Appendix 1).

16 April 2019

Dr Derek Belton **Chair, Decision Making Committee** **Environmental Protection Authority**	**Date**

Table 1: Microorganism Risk Group Descriptions, Host Organism Categories, and Genetic Modification Classifications

Microorganism Risk Group Descriptions	Risk Group 1 means microorganisms that are unlikely to cause disease in humans, animals, plants, or fungi Risk Group 2 means microorganisms that— (a) may cause disease in humans, animals, plants, or fungi but are unlikely to be a serious hazard to laboratory personnel, the community, animals, or the environment; and (b) have effective treatment and preventive measures with respect to any infections that they may cause; and (c) present a limited risk of the spread of infection. Risk group 3 means microorganisms that are pathogens— (a) that usually cause serious human, animal, or plant disease and may present a serious hazard to laboratory personnel; and (b) that could present a risk if spread in the community or the environment; and (c) in respect of which effective preventative measures or treatments are usually available. Risk Group 4 means microorganisms that are pathogens— (a) that usually cause life-threatening human or animal disease and present a serious hazard to laboratory personnel; and (b) that are readily transmissible from— (i) an individual human to another human or to an animal; or (ii) an individual animal to another animal or to a human; and (c) in respect of which effective treatment and preventive measures are not usually available.
Host Organism Categories	A Category 1 host organism is an organism that— (a) is clearly identifiable and classifiable according to genus, species, and strain or other sub-specific category as appropriate; and (b) is not normally able to cause disease in humans, animals, plants, or fungi; and (c) does not contain infectious agents normally able to cause disease in humans, animals, plants, or fungi; and (d) does not produce desiccation-resistant structures, such as spores or cysts, that can normally be disseminated in the air; and (e) is characterised to the extent that its main biological characteristics are known; and (f) does not normally infect, colonise, or establish in humans. A Category 2 host organism is an organism that— (a) is clearly identifiable and classifiable according to genus, species, and strain or other sub-specific category as appropriate; and (b) is—

	(i) a microorganism of risk group 1 or risk group 2 (A) is or contains an infectious agent pathogenic to humans, animals, plants, or fungi; or (B) produces desiccation-resistant structures, such as spores or cysts, that may normally be disseminated in the air; or (C) is not characterised to the extent that its main biological characteristics are known; or (D) normally infects, colonises, or establishes in humans; or (ii) a mammalian cell line containing active viruses or infectious agents normally able to cause disease in humans; or (iii) a whole animal, vertebrate or invertebrate, including oocytes, zygotes, early embryos, and other cells able to grow without human intervention into a whole animal; or (iv) a whole plant.
Genetic Modification Classifications	A Class A genetic modification is a modification that— (a) involves a Category 1 host organism; and (b) does not increase the pathogenicity, virulence, or infectivity of the host organism to laboratory personnel, the community, or the environment; and (c) does not result in the genetically modified organism having a greater ability to escape from containment than the unmodified host organism. A Class B genetic modification is a modification that involves either- (a) a Category 1 host organism, or a Category 2 host organism. If a Category 1 host organism is used,— the modification must not— (i) result in a genetically modified organism that is more pathogenic, virulent, or infectious to laboratory personnel, the community, or the environment than a Category 2 host organism; and (ii) result in the genetically modified organism having a greater ability to escape from containment than the unmodified host organism. If a Category 2 host organism is used,— (a) the modification must involve either- (i) a host organism that is not normally able to cause disease in humans, animals, plants, or fungi; or (ii) a host organism that is normally able to cause disease in humans, animals, plants, or fungi provided that the nucleic acid that is introduced is characterised to the extent that— (A) its sequence is known; and (B) its gene function is understood; and (C) its potential gene products are understood; and (b) the modification must not—

	(i) increase the pathogenicity, virulence, or infectivity of the host organism to laboratory personnel, the community, or the environment; and (ii) result in the genetically modified organism having a greater ability to escape from containment than the unmodified host organism.

Table 2: Host organisms to be developed under APP202708

Host organisms	**Risk Group 1 microorganisms** including (but not limited to) Bacteria, Archaea, Viruses (including Bacteriophages), eukaryotic microbes (Algae, Fungi (including Yeasts), Phytoplankton, Zooplankton, Protozoa and Micro-invertebrates) that are unlikely to cause disease in humans, animals, plants, or fungi. **Risk Group 2 microorganisms** including (but not limited to) Bacteria, Archaea, Viruses (including Bacteriophages), eukaryotic microbes (Algae, Fungi (including Yeasts), Phytoplankton, Zooplankton, Protozoa and Micro-invertebrates that may cause disease in humans, animals, plants, or fungi but are unlikely to be a serious hazard to laboratory personnel, the community, animals, or the environment, and have effective treatment and preventive measures with respect to any infections that they may cause, and present a limited risk of spread on infection. **Animal cell lines, tissues and organoids (as Category 1 host organisms)** (including immortalized and primary cell lines) from organisms within the Kingdom Animalia, Phyla Arthropoda, Chordata, and Euarthropoda. Animal cell lines may include induced pluripotent stem cell lines and embryonic stem cell lines. Animal cell lines will be established cell lines obtained from commercial sources or reputable scientific laboratories. **Human cell lines, tissues and organoids (as Category 1 host organisms)** (including immortalized and primary cell lines). Human cell lines may include induced pluripotent stem cells, but not human embryonic stem cell lines. Human and animal cell lines will be established cell lines obtained from commercial sources or reputable scientific laboratories. Human cell lines might be primary cells developed with Human Ethics Committee approval in the country of origin. This includes cell lines taken from individuals identified as Māori as long as consents from individuals involved have been obtained. **Plant cells and tissues (as Category 1 host organisms)** including protoplasts, cultured cells, and tissue from organisms within Angiospermae (flowering plants). **Terrestrial laboratory animals (as Category 2 host organisms)** *Mus musculus* L., 1758 – Mouse. *Rattus norvegicus* Berkenhout, 1759 – Brown rat, Norway rat, laboratory rat. *Rattus rattus* L., 1758 – Black rat, ship rat. *Drosophila melanogaster* Macquart, 1843 (syn. *Sophophora melanogaster*) – Fruit fly, vinegar fly. *Caenorhabditis elegans* Maupas, 1900 – Roundworm. *Dugesia japonica* Ichikawa & Kawakatsu, 1964 – Flatworm. *Dugesia dorotocephala* Girard, 1850 – Flatworm. *Schmidtea mediterranea* Benazzi, Baguñà, Ballester, Puccinelli & Del Papa, 1975 – Flatworm. *Neppia montana* Nurse, 1950 – Flatworm. *Ovis aries* L. 1758 ─ Sheep. *Gallus domesticus* Linneaus, 1758 ─ Chicken. *Gallus gallus* Linneaus, 1758 ─ Red junglefowl.

Aquatic laboratory animals (as Category 2 host organisms)

Danio rerio Hamilton-Buchanan, 1822 – Zebrafish.

Xenopus laevis Daudin, 1802 – African clawed frog.

Modifications to *Ovis aries*, *Gallus domesticus*, *Gallus gallus*, and *Xenopus laevis* may not be carried out until a suitable containment facility for the organisms is provided by the approval holder, and which is approved for use by MPI.

Plant species (as Category 2 host organisms)

Actinidia deliciosa C.F.Liang & A.R.Ferguson – Chinese gooseberry, kiwifruit. Taxonomic family: Actinidiaceae.

Actinidia chinensis Planch. Taxonomic family: Actinidiaceae.

Allium cepa L., 1753. – Onion. Taxonomic family: Amaryllidaceae.

Asplenium bulbiferum G. Forst – Hen, chicken fern. Taxonomic family: Aspleniaceae.

Asplenium flabellifolium Cav – Butterfly fern. Taxonomic family: Aspleniaceae.

Arabidopsis thaliana L. Heynh – Mouse-ear cress, thale cress, arabidopsis. Taxonomic family: Brassicaceae.

Arachis hypogaea L. – Peanut, groundnut. Taxonomic family: Fabaceae.

Brachypodium distachyon P.Beauv, 1812 – Purple false brome. Taxonomic family: Poaceae.

Brassica napus L. – Canola. Taxonomic family: Brassicaceae.

Brassica rapa L. – Turnip rape, field mustard, bird rape, and keblock. Taxonomic family: Brassicaceae.

Capsicum annuum L. – Pepper. Taxonomic family: Solanaceae.

Carica papaya L. – Papaya, pawpaw. Taxonomic family: Caricaceae.

Cicer arietinum L. – Chickpea. Taxonomic family: Fabaceae.

Daucus carota L. – Carrot. Taxonomic family: Apiaceae.

Gillenia trifoliata L. Moench. – Bowman's root. Taxonomic family: Rosaceae.

Glycine max L. – Soybean, soya bean. Taxonomic family: Fabaceae.

Lens culinaris Medik. – Lentil. Taxonomic family: Fabaceae.

Lolium multiflorum Lam., 1778. – Italian ryegrass, annual ryegrass. Taxonomic family: Poaceae.

Lolium perenne L., 1753. – Perennial ryegrass, English ryegrass, winter ryegrass. Taxonomic family: Poaceae.

Lotus corniculatus L., 1753. – Birdsfoot trefoil. Taxonomic family: Fabaceae.

	Malus domestica Borkh. – Apple. Taxonomic family: Rosaceae. *Medicago arabica* L. Huds. – Heart clover. Taxonomic family: Fabaceae. *Medicago minima* L. – Little bur-clover. Taxonomic family: Fabaceae. *Medicago sativa* L., 1753. – Lucerne, alfalfa. Taxonomic family: Fabaceae. *Medicago truncatula* Gaertn., 1791. – Barrel medic. Taxonomic family: Fabaceae. *Nicotiana benthamiana* Domin., 1929. – Taxonomic family: Solanaceae. *Nicotiana tabacum* L., 1753. – Tobacco. Taxonomic family: Solanaceae. *Physcomitrella patens* (Hedw.) Bruch & Schimp. – Spreading earthmoss. Taxonomic family: Funariaceae. *Oryza sativa* L. – Asian rice. Taxonomic family: Poaceae. *Persea americana* L. – Avocado. Taxonomic family: Lauraceae. *Physalis ixocarpa* L. – Tomatillo. Taxonomic family: Solanaceae. *Physalis peruviana* L. – Cape gooseberry. Taxonomic family: Solanaceae. *Physalis pruinosa* L. – Ground cherry. Taxonomic family: Solanaceae. *Pisum sativum* L. – Garden pea. Taxonomic family: Fabaceae. *Solanum betaceum* Cav. – Tamarillo. Taxonomic family: Solanaceae. *Solanum lycopersicum* L., 1753 – Tomato. Taxonomic family Solanacae. *Solanum melongena* L. – Eggplant. Taxonomic family Solanacae. *Solanum muricatum* Aiton – Pepino. Taxonomic family Solanacae. *Solanum tuberosum* L. – Potato. Taxonomic family Solanacae. *Solanum quitoense* L. – Naranjilla. Taxonomic family: Solanaceae. *Swainsona formosa* L. – Stuart's desert pea. Taxonomic family: Fabaceae. *Trifolium incarnatum* L. – Crimson clover. Taxonomic family: Fabaceae. *Trifolium occidentale* D. E. Coombe 1961. – Western Clover, Taxonomic family: Fabaceae. *Trifolium pratense* L. – Red clover. Taxonomic family: Fabaceae. *Trifolium repens* L. – White Clover. Taxonomic family: Fabaceae. *Trigonella foenum-graecum* L. – Fenugreek. Taxonomic family: Fabaceae. *Vasconcellea spp*. A.St-Hil. – Mountain papaya. Taxonomic family: Caricaceae. *Zea mays* L. – Maize, corn. Taxonomic family: Poaceae.
Modifications	**Class A and Class B genetic modifications** **Modifications may include, (but are not limited to):** • the introduction, deletion or modification of nucleic acids (DNA or RNA);

- gene activation/repression, deletion and point mutations with or without the addition of genetic material (such as use of CRISPR/Cas9-based tools or other gene editing techniques)
- the introduction of wild-type genes and mutants thereof (e.g. deletion, substitution and chimaeric mutant genes)
- the expression of multiple transgenes

Modifications may be made using (but are not limited to):

- plasmid or bacteriophage-based cloning, binary, and protein expression vectors;
- genome editing technologies;
- purified nucleic acids with or without an origin of replication that functions in the host organism
- extracellular vesicles
- Cre/Lox system
- cDNA and genomic libraries; and
- viral and transposon-based vectors, including characterised replication-defective viral vectors including but not limited to replication-defective retroviral vectors (including lentiviral vectors), adenoviral vectors, replication defective adeno- associated viral (AAV) vectors
- replicative viral vectors (including baculovirus-based vectors (such as BacMam, FUCCI), which are non-replicating in mammalian cells).

Vectors may contain regulatory elements including, but not limited to, promoters, regulatory element binding sites, transcriptional activators, enhancers, terminators, multiple cloning sites, site directed recombination sequences, T-DNA border sequences, silencing elements (short interfering RNA, short hairpin RNA) and origins of replication. The vectors may contain selectable marker genes, reporter genes, antibiotic resistance genes, enzyme-encoding sequences, transposons, recombination sequences and recombinases; retrotransposons or other transposable elements; protein targeting, localisation and secretory signals; internal ribosomal entry sites (IRES); self-cleaving sequences; solubility enhancement tags; protein purification tags, and affinity tags including epitope tags.

Donor genetic material may consist of (but is not limited to) non-coding nucleic acids and/or nucleic acids that code for genes; gene regulatory elements; transposons, retrotransposons or other transposable elements; reporters or selectable markers.

Donor genetic material may be sourced from plant, animal (including protozoa, chromista, zooplankton and phytoplankton), human, insect, bacterial, archaeal, fungal (including yeasts), viral, or synthetic sources.

In all cases, genetic modifications must satisfy the requirements of either a Class A or Class B genetic modification (Appendix 3 of this report).

Modifications will not include:

- Risk Group 3 or Risk Group 4 microorganisms as host organisms
- genes that encode proteins that are involved in the production of vertebrate toxins with an LD_{50} < 100 µg/kg;

	• developments involving viral vectors whose host range includes human cells and that contain one or more inserted nucleic acid sequences coding for a product that can lead to uncontrolled mammalian cell proliferation or be toxic to mammalian cells, or both • the production of infectious particles normally able to cause disease in humans, animals, plants, or fungi, other than those that satisfy the requirements of a Class A or Class B genetic modification (Appendix 3) • developments involving replication-defective viral vectors with the potential to restore replication in the viral vector, other than those that satisfy the requirements of a Class A or Class B genetic modification (Appendix 3) • developments involving recombination between whole viral genomes, viroids, or complementary fragments of these genomes, where one or more fragments contain one or more virulence determinants or photogenic determinants, including developments that can alter the host range of a pathogen or that increase the virulence or infectivity of the virus • developments involving the introduction of genes determining pathogenicity into microorganisms other than Category 1 host organisms involved in Class A genetic modification (Appendix 3) • developments involving microorganisms that are capable of causing disease in humans, animal, plants, or fungi unless the developments only involve cloning genetic material that is well characterised and is known not to increase the virulence or infectivity of the host • pathogenic microorganisms where the genetic modification results in resistance to any antibiotics used for clinical, veterinary, agricultural or horticultural treatment of infections caused by that microorganism • any other genetic modifications that do not satisfy the requirements of a Class A or a Class B genetic modification (Appendix 3) • genetic material derived from New Zealand native or valued flora and fauna, unless consultation has been conducted with Ngāti Whātua representatives and, if appropriate, other iwi; • genetic material from species listed by the Convention on International Trade in Endangered Species (CITES) without proof that its provenance is from a source other than the species' natural environment (eg, a laboratory source, or a publicly available nucleic acid sequence database); • modifications that would lead to the shedding of infectious virus, virions, or viroids other than those satisfy the requirements of Class A or Class B genetic modifications. • modifications including embryonic stem cell lines directly derived from humans.
Modifications to microorganisms	**Modified microorganisms** may be grown by large-scale fermentation (ie, culture volumes greater than 10 L) subject to authorisation and inspection by the UABSC and/or MPI to confirm that the fermentation facility meets the requirements for large-scale fermentation detailed in the University's MPI-approved containment management plan. **Modifications to Risk Group 2 microorganisms will only include** nucleic acid that is sourced from Risk Group 1 microorganisms, or that is characterised to the extent that: • its sequence is known; and • its gene function is understood; and • its potential gene products are understood

	Modifications to Risk Group 2 microorganisms will not include: • uncharacterised sequences from pathogenic microorganisms
Modifications to animal and human cells, tissues and organoids	Modified animal and human cell lines to be developed will be established cell lines obtained from commercial sources or from reputable scientific laboratories, or will be primary cell lines developed with appropriate ethical approval in their country of origin. Verification that primary human cell lines were obtained under appropriate ethical approval will be obtained by the researcher wishing to develop the cell lines and sighted by the UABSC before experimental work commences. Cell lines may include embryonic stem cell and induced pluripotent stem cell lines of animal species and induced pluripotent stem cell lines derived from humans, but will not include embryonic stem cell lines derived from humans. Modified human or animal cell lines may be used to regenerate tissues, explants or organs, but will not be used for the regeneration of whole animals. **Modification of human and animal cell lines may include** the generation of induced pluripotent stem cells (iPSCs) using chemical or non-viral delivery methods that satisfy the requirements of a Class A or Class B genetic modification, but **Modifications of human and animal cells, tissues and organoids will not include** the generation of iPSCs using viral delivery of Yamanaka factors (OKSM) or any oncogenes Modified cell lines, tissues or organoid might be used for injection/transplantation into laboratory animals in accordance to guidelines and protocols established by the University of Auckland Animal Ethics Committee. **Modifications of human and animal cells lines may include** modifications that result in the production of replication-defective viral vectors using packaging cell lines. Replication-defective viral vectors may be derived from Retroviruses (including lentiviruses), Adenoviruses and Adeno-Associated Viruses.
Modifications to animals	**Modifications to animals** will be limited to the terrestrial and aquatic laboratory animals and listed in the application and above under the Category 2 host animals headings. Modifications to animals may include the generation of transgenic, knock-out and gene edited animals. Modifications to animals may additionally include the creation of genetically modified animals with new genotypes by the crossing of two genetically modified animals of different genotypes including different genetic modifications. In all cases, animals to be crossed will belong to the same species. Interspecific crosses will not be carried out under this approval. Genetically modified animals may also be transplanted with genetically modified cells or tissue (xenograft and allograft). **Modifications to animals will only include** nucleic acid that is characterised to the extent that: • its sequence is known; and • its gene function is understood; and • its potential gene products are understood.

	Modifications to *Ovis aries*, *Gallus domesticus*, *Gallus gallus*, and *Xenopus laevis* may not be carried out until a suitable containment facility for the organisms is provided by the approval holder, and which is approved for use by MPI.
Modifications to plant species, tissues and cell cultures	**Modifications to plant species, plant tissues and cell cultures may only include** well-characterised genetic material. Genetic modifications to plants and plant cells may include the insertion of sequences derived from microorganisms capable of causing disease in plants; including promoters from Cauliflower Mosaic Virus, and border and regulatory sequences from *Agrobacterium tumefaciens* or *Agrobacterium rhizogenes* (ie, left and right border sequences required for the transfer of DNA into plant cells; promoters and 3' non-coding sequences derived from Ti or Ri plasmid genes). Modification to plants may include the propagation of genetically modified whole plants by cloning or by generation from cultured plant cells or tissue cultures only if the plant species are named as whole plants approved for genetic modification under this approval. **Modification to plant species, tissues and cell cultures will not include:** • modifications that would lead to the shedding of infectious virus, virions, or viroids other than those satisfy the requirements of Class A or B genetic modifications

Appendix 1: Controls required by this approval[4]

Any persons developing the approved organisms under the approval granted by this decision (each referred to as the approval holder) must ensure compliance with the controls set out below in respect of any activity they carry out under this approval in a facility under their control.

Requirement for the containment of approved organisms

1. The approved organism(s) (as described in Tables 1 and 2) must be contained.

Requirements for accountability for compliance with controls

2. The organisation, entity or person(s) responsible for the ownership, control and management of the containment facility where the approved organisms are held (including Board members and/or directors) must ensure compliance with the controls of this approval.

Requirement to specify how controls will be met

3. Procedures that specify how the controls will be implemented and complied with must be documented, and these procedures must be reviewed at least annually to ensure they:
   a) are effective in maintaining containment and achieving their purpose,
   b) reflect any relevant changes in the facility and its operation, and
   c) incorporate any improvements to best practice.

4. The containment facility must be operated in compliance with the documentation specified in control 3.

Requirements for the containment regime

5. The containment facility where the approved organisms will be held must be clearly defined, described, and documented, including the location and boundaries.

6. The containment facility must be designed, constructed, managed, and maintained to prevent the approved organism(s) from escaping.

7. Persons entering and exiting the containment facility must do so in a way that does not adversely affect containment of the approved organism(s).

8. The approved organism(s) must be identifiable as a new organism and be able to be linked to the relevant HSNO Act approval.

Requirements for notification to the EPA and/or MPI

9. Notification must be given to MPI of any movement of approved organisms outside of the facility, or any proposed modification to the containment regime which may affect the integrity of containment of the approved organism(s), before the actions are undertaken.

[4] Compliance with the controls imposed under this approval does not affect the requirements of the Biosecurity Act 1993, including any authorisations or approvals that may be required under that Act (such as approval of containment facilities by MPI).

10. The EPA and MPI must be notified in writing before this HSNO Act approval is used for the first time.

11. MPI must be notified as soon as possible, and within 24 hours, of any escape and/or breach of containment and the actions taken in response to that incident.

Requirements for moving approved organisms

12. The approved organism(s) must be contained during movement within, to, or from the containment facility.

13. When being moved outside of a containment facility, within New Zealand, the approved organism(s) must be accompanied by documentation stating the:
    a) Identity of the approved organism(s)
    b) Containment requirements
    c) Details of the sender
    d) Details of the receiving facility.

Requirements to limit access to the containment facility

14. Unauthorised persons must be excluded from the containment facility.

15. All containment facility entrances must be clearly identified including specifying who has the right of access.

16. The number and location of entrances to the containment facility where the approved organism(s) are held must be identified and documented.

Requirements for removing equipment and waste from the containment facility

17. Any waste (including biological material) that may harbour the approved organism(s), or heritable material from the approved organism, must be treated to ensure that the approved organism or any heritable material is killed prior to disposal.

18. Any equipment, that may harbour the approved organism(s) or heritable material from the approved organism, must be treated to ensure that the approved organism or any heritable material is killed prior to the equipment being used for another purpose or being removed from the containment facility.

Requirement for dealing with undesirable organisms

19. The containment facility must be secured and monitored to ensure the exclusion of undesirable organisms that might compromise the containment of the approved organism(s).

Requirements for instruction and training

20. Any person (including contractors, staff, students, visitors, and volunteers) entering the containment facility must have received sufficient instruction on the containment regime to enable the person to meet their responsibilities in relation to containment.

Requirements for contingency plans

21. There must be a documented contingency plan for each approved organism held in the containment facility.

22. The contingency plan must be implemented immediately if there is any reason to believe that an approved organism has escaped or been released from the containment facility, or any other breach of containment has occurred.

Requirements for internal inspections and monitoring

23. To ensure containment is being achieved, containment measures must be:
    a) Inspected, monitored and reviewed as appropriate
    b) Inspected as soon as possible after any event that could compromise the containment regime, such as an Act of God (such as flood, earthquake) or any unauthorised attempt to enter the containment facility.

24. Any remedial requirements identified under control 23, or by any other means, must be actioned as soon as possible.

Additional controls

25. Developments of *Ovis aries*, *Gallus domesticus*, *Gallus gallus*, and *Xenopus laevis* via genetic modification cannot be undertaken until the approval holder provides a containment facility (or facilities) suitable for the specific containment requirements of each of the organisms, and which is approved for use by MPI.

26. The EPA and MPI must be notified in writing before this HSNO Act approval is used for genetic modification of *Ovis aries*, *Gallus domesticus*, *Gallus gallus*, and *Xenopus laevis*.

Interpretation

27. In these controls, unless otherwise specified below, a word has the same meaning as it is defined in the HSNO Act (if any).

28. Unless the context otherwise requires:

Term	Definition
approved organism(s)	New organisms approved for importation and/or development in containment under applications APP201957, APP201958 and APP201959 (as described in Tables 1 and 2) for research and teaching purposes.
authorised person	Authorised persons are those identified in the containment facility documentation as being allowed to be in the containment facility or any part thereof.
breach	Escape of organism(s), unauthorised entry to the facility and/or the structural integrity of the facility being compromised.
containment	Restricting an organism to a secure location or facility to prevent escape (section 2 of the HSNO Act).
containment facility	A place approved by MPI in accordance with section 39 of the Biosecurity Act 1993, for holding approved organisms.
contingency plan	A plan devised for a specific situation where things could go wrong, for example escape of an approved organism. It contains information, tasks and procedures that are necessary for timely decision-making and response to an unexpected event, or situation where the preferred plan fails.
controls	Any obligations or restrictions imposed on any approved organism, or on any person in relation to any approved organism, by the HSNO Act, or any regulations, rules, codes, or other documents made in accordance with the provisions of this or any other Act for the purposes of controlling the adverse effects of that organism on people or the environment (section 2 of the HSNO Act).
disposal	The action or process of discarding or getting rid of something, including but not limited to burial, incineration, or placing in the general waste. [Excludes the act of transferring to another containment facility under section 29 of the Biosecurity Act]
documentation	Written or electronic records (including manuals, lists, diagrams, maps, policies, procedures, plans and protocols, records of training, access).
EPA	The Environmental Protection Authority.

heritable material	(In relation to an approved organism) viable biological material, including gametes and spores, arising from that organism that can, without human intervention, regenerate the organism or reproduce a new generation of the same species of the organism (section 2, HSNO Act).
HSNO Act	Hazardous Substances and New Organisms Act 1996.
MPI	Ministry for Primary Industries.
new organism	Defined by section 2A of the HSNO Act (a) an organism belonging to a species that was not present in New Zealand immediately before 29 July 1998 (b) an organism belonging to a species, subspecies, infra-subspecies, variety, strain, or cultivar prescribed as a risk species, where that organism was not present in New Zealand at the time of promulgation of the relevant regulation (c) an organism for which a containment approval has been given (ca) an organism for which a conditional release approval has been given under the HSNO Act (cb) a qualifying organism approved for release with controls (d) a genetically modified organism (e) an organism that belongs to a species, subspecies, infra-subspecies, variety, strain, or cultivar that has been eradicated from New Zealand.
organism	Defined in section 2 of the HSNO Act: (a) Does not include a human being (ab) Includes a human cell (b) Includes a micro-organism (c) Includes a genetic structure, other than a human cell, that is capable of replicating itself, whether that structure comprises all or only part of an entity, and whether it comprises all or only part of the total genetic structure of an entity (d) Includes an entity (other than a human being) declare to be an organism for the purposes of the Biosecurity Act 1993 (e) Includes a reproductive cell or developmental stage of an organism.
treat (with reference to waste)	Kill all approved organisms and make heritable material non-viable.
undesirable organism	Organisms such as rodents, insects, and birds within the containment facility that could compromise containment (dependent on what organism is being contained).
waste	Unusable or unwanted substances or materials (including water, liquids, solids or air).

Table 3: approval number of host organisms to be developed

Organism to be considered	Approval number
Microorganisms	
Risk Group 1 microorganisms including Bacteria, Archaea, Viruses (including Bacteriophages), eukaryotic microbes (Algae, Fungi (including Yeasts), Phytoplankton, Zooplankton, Protozoa and Micro-invertebrates).	GMD102442
Risk Group 2 microorganisms including Bacteria, Archaea, Viruses (including Bacteriophages), eukaryotic microbes (Algae, Fungi (including Yeasts), Phytoplankton, Zooplankton, Protozoa and Micro-invertebrates).	GMD102443
Terrestrial laboratory animals	
Mus musculus Linnaeus 1758	GMD102444
Rattus norvegicus Berkenhout 1759	GMD102445
Rattus rattus Linnaeus 1758	GMD102446
Drosophila melanogaster Macquart 1843	GMD102447
Caenorhabditis elegans Maupas 1900	GMD102448
Dugesia japonica Ichikawa & Kawakatsu, 1964	GMD102449
Dugesia dorotocephala Girard, 1850	GMD102450
Schmidtea mediterranea Benazzi, Baguñà, Ballester, Puccinelli & Del Papa, 1975	GMD102451
Neppia montana Nurse, 1950	GMD102452
Ovis aries Linnaeus 1758	GMD102453
Gallus domesticus Linneaus 1758	GMD102454
Gallus gallus Linneaus 1758	GMD102455
Aquatic laboratory animals	
Danio rerio Hamilton-Buchanan 1822	GMD102456
Xenopus laevis Daudin 1802	GMD102457
Animal cell lines, tissues and organoids	
Animal cell lines (including immortalised and primary cells) from the Kingdom Animalia, including Phylum Arthropoda, Phylum Chordata and Phylum Euarthropoda. Animal cell lines may	GMD102458

Organism to be considered	Approval number
include induced pluripotent stem cell lines and embryonic stem cell lines	
Human cell lines, tissues and organoids	
Human cell lines (including immortalised and primary cells). Human cell lines may include induced pluripotent stem cell lines, but will not include human embryonic stem cell lines.	GMD102459
Whole plants	
Actinidia deliciosa C.F.Liang & A.R.Ferguson	GMD102460
Actinidia chinensis Planch	GMD102461
Allium cepa L. 1753	GMD102462
Asplenium bulbiferum G. Forst	GMD102463
Asplenium flabellifolium Cav	GMD102464
Arabidopsis thaliana (L.) Heynh.	GMD102465
Arachis hypogaea (L.)	GMD102466
Brachypodium distachyon P.Beauv 1812	GMD102467
Brassica rapa L.	GMD102468
Brassica napus L.	GMD102469
Capsicum annuum L.	GMD102470
Carica papaya L.	GMD102471
Cicer arietinum L.	GMD102472
Daucus carota L.	GMD102473
Gillenia trifoliata (L.) Moench	GMD102474
Glycine max (L.)	GMD102475
Lens culinaris Medik	GMD102476
Lolium multiflorum Lam. 1778	GMD102477
Lolium perenne L. 1753	GMD102478
Lotus corniculatus L. 1753	GMD102749
Malus domestica Borkh	GMD102480
Medicago arabica (L.) Huds	GMD102481
Medicago minima L.	GMD102482

Organism to be considered	Approval number
Medicago sativa L. 1753	GMD102484
Medicago truncatula Gaertn. 1791	GMD102485
Nicotiana benthamiana Domin. 1929	GMD102486
Nicotiana tabacum L. 1753	GMD102483
Physcomitrella patens (Hedw.) Bruch & Schimp.	GMD102487
Oryza sativa (L.)	GMD102488
Persea Americana (L.)	GMD102489
Physalis ixocarpa L.	GMD102490
Physalis peruviana L.	GMD102491
Physalis pruinosa L.	GMD102492
Pisum sativum L.	GMD102493
Solanum betaceum Cav.	GMD102494
Solanum lycopersicum L	GMD102495
Solanum melongena L.	GMD102496
Solanum muricatum Aiton	GMD102497
Solanum tuberosum L.	GMD102498
Solanum quitoense L.	GMD102499
Swainsona formosa L.	GMD102500
Trifolium incarnatum L.	GMD102501
Trifolium occidentale D. E. Coombe 1961	GMD102502
Trifolium pratense L.	GMD102503
Trifolium repens L.	GMD102504
Trigonella foenum-graecum L.	GMD102505
Vasconcellea spp. A.St-Hil	GMD102506
Zea mays L.	GMD102507
Plant cells and tissue	
plant cells including protoplasts, cultured cells, and tissue. Taxonomic level: Angiospermae.	GMD102508