ENVIRONMENTAL RISK MANAGEMENT AUTHORITY DECISION

02 May 2008

Application code:	GMD08037
Application category:	To develop in containment genetically modified organisms under sections 40(1)(b) and 42A of the Hazardous Substances and New Organisms (HSNO) Act 1996.
Applicants:	AgResearch Limited Cawthron Institute Genesis Research and Development Corporation Limited Institute of Environmental Science and Research Ltd (ESR) Landcare Research NZ Ltd Lincoln University Massey University Museum of New Zealand - Te Papa Tongarewa New Zealand Forest Research Institute Ltd New Zealand Institute for Crop and Food Research Ltd Victoria University of Wellington The Horticulture and Food Research Institute of New Zealand Ltd University of Auckland University of Canterbury University of Otago
Purpose:	To develop genetically modified non-pathogenic strains of *Escherichia coli* and bacteriophage in order to answer identification, taxonomic, population or evolutionary questions for a wide range of genes and organisms
Date application received:	30 April 2008
Consideration date:	02 May 2008
Considered by:	Chief Executive, ERMA New Zealand

1 Summary of Decision

1.1 Application GMD08037 to develop, as a project, genetically modified organisms (as described in Table 1 of this decision) in containment is **approved, with controls** (see Appendix 1 of this decision), having been considered in accordance with section 42A of the Hazardous Substances and New Organisms (HSNO) Act 1996 (the Act), the HSNO (Low-Risk Genetic Modification) Regulations 2003 (the Regulations), and the HSNO (Methodology) Order 1998 (the Methodology).

The organisms approved are:

1.2 The organisms approved for development are the genetically modified organisms described in Table 1:

Table 1: Organisms as recorded on ERMA New Zealand Register

Host organism	Category of host organism	Modified by:	Category of modification/ containment level
Escherichia coli (Migula 1895) Castellani and Chalmers 1919 non pathogenic laboratory strains	1	Standard non-conjugative plasmid cloning vectors, bacteriophage and standard bacteriophage plasmid vectors. Vectors will include standard and commercially available promoters and other gene regulatory elements, reporter and selectable marker genes and origins of replication. Expression plasmid vectors are excluded from this approval. The donor genetic material will be sourced from Kingdoms Animalia, Plantae, Fungi, Protista and Monera and viruses and viroids and will include sequences of DNA marker motifs such as microsatellite regions and the coding, non-coding and regulatory regions of genes used in identification, phylogenetic, taxonomic or population studies such as the ribosomal loci. Other sequences may also be used as required to address specific scientific or technical questions. Libraries may also be created from genomic or complementary DNA from the Kingdoms Animalia, Plantae, Fungi, Protista and Monera and viruses and viroids. The modifications will not: • Involve any human genetic material or genetic material from native biota. • Involve any genetic material from CITES listed species, unless the appropriate approval has been obtained. • Intentionally express protein.	A/PC1
Bacteriophage lambda (ICTV approved name is Enterobacteria phage λ), non pathogenic laboratory strains	1		A/PC1

		• Intentionally produce infectious particles (except for bacteriophage). • Intentionally increase the pathogenicity, virulence, or infectivity of the host organism or enhance its ability to escape containment.	

2 Consideration

Sequence of the consideration

2.1 The application was formally received and verified as containing sufficient information on 30 April 2008.

2.2 The decision was based on the information supplied by the applicant in the application form: *Develop in containment a project of low risk genetically modified organisms by rapid assessment* (NO3P).

2.3 The application was considered by Rob Forlong, the Chief Executive of ERMA New Zealand. Relevant staff within ERMA New Zealand, including the General Manager, Māori, were involved in providing advice on the consideration of the application.

2.4 In reaching my decision I considered that the organism description and purpose described in this application fall within the bounds of a project. This programme of work has defined objectives regarding identification, taxonomy, population or evolution, is carried out within a containment structure, comprises the use of defined ranges of host organisms, vectors and donor material, and provides a sufficient description of the genetically modified organisms which will be produced to confirm that they conform to the Regulations.

2.5 In reaching my decision I have considered matters relevant to the purpose of the Act, as specified in Part II, and followed the relevant provisions of the Methodology.

2.6 In accordance with section 42A of the Act for rapid assessment, the approach adopted was to identify the circumstances of the genetic modification, to evaluate these against the criteria specified in the Regulations established under section 41 of the Act, and to consider whether there are any residual risks that require further consideration. This approach covered the following issues:

- purpose of the application (section 39 of the Act);
- assessment against the criteria of the Regulations;
- identification and assessment of the risks and other impacts of the organism;
- precedents; and
- containment controls.

Purpose of the application

2.7 The purpose of this application is to develop genetically modified non-pathogenic strains of *E. coli* and bacteriophage lambda to allow for the identification of genes and organisms and to allow studies of a taxonomic, population and/or evolutionary nature. In order to achieve this purpose, genetic material from the Kingdoms Animalia, Plantae, Fungi, Protista and Monera and viruses and viroids will be collected and the DNA extracted, or RNA extracted and transcribed to complementary DNA (cDNA). The DNA or cDNA fragments will then be inserted into the non-pathogenic strains of *E. coli* and bacteriophage lambda for DNA sequence analysis.

2.8 I have determined that this application is for a valid purpose being *the development of any new organism* as provided for in section 39(1)(a) of the Act.

2.9 I note that prior to using this approval, each user must confirm: that the proposed research meets the purpose of this approval (ie, to answer identification, taxonomic, population or evolutionary questions); that the organisms will be maintained as per the containment controls placed on this approval (Appendix 1); and that to the best of their knowledge the genetic modifications they intend to perform fall under the approved organism description in Table l.

Assessment against the criteria for low-risk genetic modification

Category of host organism

2.10 The non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda to be used by the applicant are not capable of causing disease in humans, animals, plants or fungi, do not normally infect, colonise, or establish in humans, nor do they produce desiccation-resistant structures, such as spores or cysts. As such, non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda are considered Category 1 host organisms as defined in clause 7(1) of the Regulations.

Category of genetic modification

2.11 I note that research using known native genetic material is not covered under this approval. However, I acknowledge that in studies where sequencing will be used to identify an organism, it may not be possible to know whether an organism is native until after the sequencing is complete. Therefore, additional control 8.1 has been imposed (as described in paragraph 2.13).

2.12 I further note that intentional protein expression (ie, expression of protein from the sequences cloned into the plasmid vector), intentional production of infectious particles (excluding bacteriophage) or modifications that intentionally increase the pathogenicity, virulence, or infectivity of the host organism or enhance its ability to escape containment are not permitted under this approval. Therefore, users of this approval must not knowingly use vector systems or donor genetic material that will produce protein or infectious particles or increase the pathogenicity, virulence, or infectivity of the host organism or enhance its ability to escape containment. However, I acknowledge that in biological systems unexpected events can occur and therefore, additional control 8.1 has been imposed to cover for these eventualities.

2.13 Additional control 8.1 requires that in the event that a genetically modified organism developed under this approval inadvertently carries native genetic material, or expresses proteins, produces infectious particles (excluding bacteriophage), or shows enhanced pathogenicity, virulence, infectivity or enhanced abilities to escape containment, ERMA New Zealand and the MAF Inspector responsible for supervision of the facility must be notified immediately and all research involving the genetically modified organism must cease. The genetically modified organism can be held in storage for up to one year while a new approval is sought. If a new approval is not obtained within a year, the genetically modified organism must be destroyed.

2.14 I note that the genetic material from organisms capable of causing disease in humans, animals, plants or fungi can be used provided that the organism description in the approval is met and none of the exclusions in Table 1 are triggered.

2.15 The genetic modifications to non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda (described in Table 1) are not expected to increase the pathogenicity, virulence or infectivity of the organisms to laboratory personnel, the community, or the environment. In addition, the developments will not result in the organisms having a greater ability to escape from containment than the unmodified organisms. Therefore, the genetic modifications to non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda as described in Table 1 of this decision are Category A genetic modifications as defined in clause 5(1) of the Regulations and shall be contained at a minimum of Physical Containment level 1 (PC1).

2.16 I am satisfied that the developments meet the criteria for low-risk genetic modification specified in the Regulations. The developments involving non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda meet the requirements of Category A modifications as defined in clause 5(1) of the Regulations.

Identification and assessment of the risks, costs and other impacts of the organism

2.17 I consider that the information provided by the applicant is relevant and appropriate to the scale and significance of the risks, costs, and benefits associated with the application (as required by clause 8 of the Methodology). In accordance with clauses 9, 10 and 12 of the Methodology (which incorporate sections 5, 6, and 8 of the Act) the information supplied by the applicant has been evaluated as follows:

2.18 I consider that, given the biological characteristics of the organisms, the containment system and the controls attached to this approval (see Appendix 1 of this decision), there is no evidence for, nor any reason to expect, any non-negligible adverse effects of the proposed genetically modified organisms on humans, animals, plants, other organisms or the environment.

2.19 I have considered the potential Māori cultural effects in accordance with sections 6(d) and 8 of the Act and clauses 9(b)(i), 9(c)(iv) of the Methodology, in consultation with the General Manager, Māori. As this application does not involve the use of genetic material from native or valued flora and fauna or from Māori, and as this application is for a development in containment, there is no requirement for the applicant to consult with Māori.

2.20 Although recognising that iwi/Māori maintain an ongoing interest and concern in the potential long term cultural implications of genetic modification generally, I consider that this application poses negligible risk of adverse effects to the relationship of Māori culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga.

2.21 This assessment is made with the understanding that all associated containment regulations, controls and conditions are met by the applicant.

Precedents

2.22 I must consider each application on its merits, and am therefore not bound by the stance taken in previous decisions. However, in reflecting on previous decisions that involved similar genetic modifications to those proposed by this application, I note that genetic modifications of non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda, conforming to the Regulations, have been considered and approved on several occasions by both Institutional Biological Safety Committees

(IBSCs) and the Chief Executive of ERMA New Zealand, under delegated authority. For example, in application GMD06033, a proposal to clone the DNA from specific plants to develop DNA markers, including microsatellites, to be used for studies in genetic variation in native and non-native plants for the purpose of addressing taxonomic and evolutionary questions was approved.

2.23 This application did raise novel issues which were discussed in paragraphs 2.11 to 2.14.

Containment

2.24 The experiments proposed in this application, to develop genetically modified non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda meet the requirements of Category A genetic modifications as defined in clause 5(1) of the Regulations. Category A experiments are required to be contained within a Physical Containment level 1 facility (PC1).

2.25 The facility to be used shall be approved and registered as a containment facility under section 39 of the Biosecurity Act, in accordance with the MAF/ERMA New Zealand Standard *Facilities for Microorganisms and Cell Cultures: 2007*. This containment regime contains clear guidelines for the safe handling and disposal of cultures.

3 Decision

3.1 I am satisfied that this application is for one of the purposes specified in section 39(1) of the Act, being section 39(1)(a): *the development of any new organism*.

3.2 Based on consideration and analysis of the information provided, and having considered the characteristics of the organisms that are the subject of this approval, the modifications and the criteria for low-risk genetic modification detailed in the Regulations, I am of the view that the organisms meet the criteria for rapid assessment under section 42A of the Act.

3.3 I have considered all the matters to be addressed by the containment controls for Importing, Developing or Field testing of Genetically Modified Organisms detailed in the Third Schedule Part I, of the Act, and in accordance with section 42A(3)(b), this approval is subject to the controls specified in Appendix 1.

3.4 Given the nature of the work approved, additional control 8.1 has been imposed requiring that in the event that one of the exclusions on this approval (outlined in Table 1) are triggered, ERMA New Zealand and the MAF Inspector responsible for supervision of the facility must be notified immediately and all research involving the genetically modified organism must cease. The genetically modified organism can be held in storage for up to one year while a new approval is sought. If a new approval is not obtained within a year, the genetically modified organism must be destroyed.

3.5 Pursuant to section 42A(3)(a) of the Act, and acting under delegation from the Authority provided for in section 19 of the Act, I have approved this project application for genetically modified non-pathogenic laboratory strains of *E. coli* and bacteriophage lambda described in Table 1 of this decision, subject to the controls specified in Appendix 1 of this decision.

_____ 02 May 2008

Mr Rob Forlong Date

Chief Executive, ERMA New Zealand

Approval codes (BCH numbers):

Approval numbers and BCH numbers for Organisms in Application GMD08037

Approval Code	Organism	BCH number
GMD005127	*Escherichia coli* (Migula 1895) Castellani & Chalmers 1919 (GMD08037)	45052
GMD005126	Bacteriophage lambda (GMD08037)	45053

Appendix 1: Controls required by this approval

In order to provide for the matters detailed in Part I of the Third Schedule of the Act[1], *Containment Controls for Importation, Development and Field Testing of Genetically Modified Organisms,* and other matters in order to give effect to the purpose of the Act, the approved organisms are subject to the following controls:

1 To limit the likelihood of any accidental release of any organism or any viable genetic material[2].

1.1 The approved organism shall be developed and maintained within a containment facility which complies with these controls.

1.2 The person responsible for a particular research area and/or the person responsible for the operation of the containment facility shall inform all personnel involved in the handling of the organism of the Authority's controls.

1.3 The facility shall be approved and registered by MAF as a containment facility under section 39 of the Biosecurity Act, in accordance with the MAF/ERMA New Zealand Standard (below), and controls imposed by the Authority (as follows):

1.4 The construction, operation and management of the containment facility shall be in accordance with the:

1.4.1 MAF/ERMA New Zealand Standard: *Facilities for Microorganisms and Cell Cultures: 2007*[3];

1.4.2 Australian/New Zealand Standard AS/NZS 2243.3:2002[3] Safety in laboratories: Part 3: Microbiological aspects and containment facilities; and

1.4.3 Physical Containment level 1 (PC1) requirements of the above Standards.

[1] Bold headings in the following text refer to Matters to be Addressed by Containment Controls for Import, Development and Field Testing of Genetically Modified Organisms, specified in the Third Schedule of the Act.
[2] Viable Genetic Material is biological material that can be resuscitated to grow into tissues or organisms. It can be defined to mean biological material capable of growth even though resuscitation procedures may be required, e.g. when organisms or parts thereof are sub-lethally damaged by being frozen, dried, heated, or affected by chemical.
[3] Any reference to this standard in these controls refers to any subsequent version approved or endorsed by ERMA New Zealand.

2 To exclude unauthorised people from the facility.

2.1 Construction and operation of the containment facility shall comply with the requirements of the standards listed in control 1.4 relating to the identification of entrances, numbers of and access to entrances and security requirements for the entrances and the facility.

3 To exclude other organisms from the facility and to control undesirable and unwanted organisms within the facility.

3.1 Construction and operation of the containment facility shall comply with the requirements of the standards listed in control 1.4 relating to the exclusion of other organisms from the facility and the control of undesirable and unwanted organisms within the facility.

4 To prevent unintended release of the organism by experimenters working with the organism.

4.1 Construction and operation of the containment facility shall comply with the requirements of the standards listed in control 1.4 relating to the prevention of unintended release of the organism by experimenters working with the organism.

5 To control the effects of any accidental release or escape of an organism.

5.1 Construction and operation of the containment facility shall comply with the requirements of the standards listed in control 1.4 relating to controlling the effects of any accidental release or escape of an organism.

5.2 If a breach of containment occurs, the facility operator must ensure that the MAF Inspector responsible for supervision of the facility has received notification of the breach within 24 hours.

5.3 In the event of any breach of containment of the organism, the contingency plan for the attempted retrieval or destruction of any viable material of the organism that has escaped shall be implemented immediately. The contingency plan shall be included in the containment manual in accordance with the requirements of standards listed in control 1.4.

6 Inspection and monitoring requirements for containment facilities.

6.1 The operation of the containment facilities shall comply with the requirements contained in the standards listed in control 1.4 relating to the inspection and monitoring requirements for containment facilities.

6.2 The containment manual shall be updated, as necessary, to address the implementation of the controls imposed by this approval, in accordance with the standards listed in control 1.4.

7 Qualifications required of the persons responsible for implementing those controls.

7.1 The training of personnel working in the facility shall be in compliance with the standards listed in control 1.4.

8 Additional controls.

8.1 In the event that a genetically modified organism developed under this approval inadvertently carries native genetic material, or expresses proteins, produces infectious particles (excluding bacteriophage), or shows enhanced pathogenicity, virulence, infectivity or enhanced abilities to escape containment, ERMA New Zealand and the MAF Inspector responsible for supervision of the facility must be notified immediately and all research involving the genetically modified organism must cease. The genetically modified organism can be held in storage for up to one year while a new approval is sought. If a new approval is not obtained within a year, the genetically modified organism must be destroyed.