



Environmental  
Protection Authority  
*Te Mana Rauhi Taiao*

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## Ngā Kaihautū Tikanga Taiao Report

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# *Clostridium magnum* Application No. ERMA200833

10 February 2012



Application for New Organism unconditional release under section 34 of the Hazardous Substances and New Organisms (HSNO) Act 1996.

Tēnā koutou katoa

## Introduction

1. My name is James Ataria and I am a member of Ngā Kaihautū Tikanga Taiao (Ngā Kaihautū). I am a descendent of the Rongomaiwahine, Ngāti Kahungunu and Ngāti Tūwharetoa tribes and I am employed as an ecotoxicologist at Lincoln University and the Cawthron Institute.
2. This report presents a Ngā Kaihautū view on the Lanza Tech New Zealand Limited (Lanza Tech) application to release from containment the anaerobic bacterium *Clostridium magnum*. Along with the application (ERMA200833) the author has examined written submissions including one from a Māori submitter.
3. Ngā Kaihautū is charged with the responsibility of providing advice and assistance, from a Māori perspective, to the Environmental Protection Authority (EPA). As part of that role, Ngā Kaihautū has considered this application under section 6(d) of the HSNO Act (1996).

## Overview of the application

4. Lanza Tech has successfully developed green chemistry<sup>1</sup> technology in laboratory containment (ERMA200833) that uses the anaerobic bacterium *C. magnum* to convert carbon-based waste and other waste gases into valuable fuels and chemical products. This application seeks approval to release this bacterium from containment to allow Lanza Tech to scale up its operations to build a pilot plant that will assess the feasibility of production at this scale and hence the commercial viability of this technology.

## Key issues

5. Perhaps the most important consideration from a Māori cultural perspective, and one that is consistently articulated for new organisms full release applications, is; “*If released will this new organism form self-sustaining populations?*” If this is a possibility then the EPA must consider the positive and negative effects of this occurrence on the outcome areas of significance to Māori, ie, environmental, cultural, health and wellbeing, economic development and Te Tiriti o Waitangi.
6. *Clostridium magnum* is an obligate anaerobe which means that the bacteria cannot survive in the presence of oxygen. If this organism was released into the environment it would require anaerobic passage into a suitable oxygen-free environment to survive, eg, anoxic sediment or the intestine of an animal. This is unlikely and therefore a key barrier against the establishment of natural

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<sup>1</sup> Green chemistry refers to the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substrates

populations should this bacteria be released into the environment as a consequence of a major malfunction or accidental release.

7. The strain of *C. magnum* that is employed by Lanza Tech is termed an 'in culture' strain. While originally sourced from the wild, it has been cultured repeatedly in the laboratory to a point where this strain is unable to produce reproductive spores, normally resistant to conditions that might otherwise kill the bacteria (Mieneck et al. 1984<sup>2</sup>). Further, metabolic functions relating to vitamin and mineral uptake and sugar production have been compromised in this strain due to the repeated culturing. This has rendered this strain of *C. magnum* dependent on human intervention (vitamin, mineral and sugar supplementation) for optimal growth. This poses another impediment to colonies establishing in the natural environment.
8. Ngā Kaihautū believes that in view of these characteristics it is highly improbable that a self-sustaining population would form if this strain of bacterium escaped into the environment.
9. However, Ngā Kaihautū is cognisant that this species was initially sourced from the natural environment and therefore it is conceivable that an approval for full release could result in the importation of *C. magnum* 'wild-type' with the ability to produce viable spores and with uncompromised metabolic functions. Therefore, Ngā Kaihautū considers it prudent that only *C. magnum* carrying the 'in-culture' strain characteristics is approved for full release.
10. Lanza Tech does acknowledge in their application that in the unlikely event that a self-sustaining population did form that eradication of the colony would be impossible. Despite claims by the applicant that a self-sustaining population of *C. magnum* would have no ostensible negative environmental effects Ngā Kaihautū could find no empirical evidence or research data in the application to support this view.
11. The potential financial and environmental gains embodied in this technology are listed as potentially major. Evidence of direct and/or indirect financial benefits to Māori were not provided and Ngā Kaihautū believes these will be negligible unless the technology can be successfully scaled up. Similarly the environmental benefits especially to air quality as a result of removal of waste gases could be significant at a local level.
12. One Māori submission was received. The submitter supports the viability of the technology from a business and technology viewpoint but does express a concern about the lack of data surrounding "downstream effects upon release" and the inability to place controls post-release.
13. This submitter also identified the willingness of the applicant to engage with Māori regarding this application and this technology. Ngā Kaihautū concurs with this view that once Lanza Tech has

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<sup>2</sup> Meinecke B., Bahl H., Gottschalk, G. 1984. Selection of an asporogenous strain of *Clostridium acetobutylicum* in continuous culture under phosphate limitation. *Applied and Environmental Microbiology*. 48. 1064-1065.

decided on the location to build the pilot plant, and any subsequent plants, that engagement with tangata whenua be initiated with a view to establishing a relationship. Ngā Kaihautū would support a request to use any EPA databases to assist with this process.

## Recommendation

Ngā Kaihautū recommends that the EPA considers this application taking into account the issues outlined above and mitigation measures as appropriate.