



Points for consideration to arise from the *Arabidopsis thaliana* investigation

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Listed below are some points for consideration which should be read in conjunction with the points mentioned in the conclusion section of the investigation summary of the report into the suspected *Arabidopsis* breach. The scope of the investigation summary was to focus on Plant & Food, Lincoln University and any subsequent criminal liability. The information below is more wide reaching.

I call them "Points for Consideration" as opposed to "Recommendations" since there may be valid reasons in some of the cases why things are done in a certain way.

Without understanding the full workings of other departments I think it would be inappropriate for me to start making recommendations but they may wish to consider and discuss these issues within their own spheres to see if working practices need to be reviewed and updated.

1. On 22 March 2005 the application to conduct the *Arabidopsis* work was formally received by ERMA from Lincoln University. The application was classed as low-risk. Under Section 42 and 42A of HSNO Act low risk applications may be determined by way of a rapid assessment process.

The rapid assessment process provides that low-risk applications may be made to an Institutional Biological Safety Committee (IBSC) properly delegated by ERMA. In this case the Biological Safety Committee was the Lincoln University Biological Safety Committee (*Appendix 1*).

For reasons of impartiality and transparency it is worth considering if there is a potential conflict of interest with the Lincoln IBSC approving a Lincoln University request to GM *Arabidopsis* plants.

2. In the case in question Plant & Food (P&F) have been responsible for storing and testing their own exhibits. In an ideal world the party that is potentially the "suspect" in a case should never store and test their own exhibits. After initially identifying the positive plants, P&F were asked by IDC to conduct further testing on *Arabidopsis* plants found in a wider geographic area.

Whilst there is no suggestion that P&F have done anything more than be open and transparent through out this investigation, they may have a vested interest in not identifying or locating any further positive samples.

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Any possible future legal action may be compromised by the fact that the primary suspect also carried out the scientific testing and security of the alleged GM plants (Exhibits).

3. Whilst the P&F PC2 facility appears to have met with ERMA / MAFBNZ containment facility standards there are some questions whether these standards are fit for purpose for this particular organism, or in this case *Arabidopsis* Plant. What I mean here is the mesh size for the extractor fans meet with the standards but the size of the *Arabidopsis* seed is smaller than the holes in the old mesh. There is also some concern around the water from the PC2 washing straight down into the storm water drain with the holes on the drain mesh cover being larger than the *Arabidopsis* seed size.
4. It has transpired that the Quarantine Inspector who was auditing and approving the PC2 facility has been working without a valid Biosecurity Warrant. This situation occurred because the QI in question resigned from MAF only to rejoin a short time later. The MAF instrument of appointment as a Biosecurity inspector pursuant to Section 103(1) (a) Clearly stipulates that *"This appointment is valid until either the employee ceases employment in the Ministry Of Agriculture and Forestry or until it is revoked by notice in writing"* There is a risk that past directions or instructions by this inspector may have been given unlawfully. (Appendix 10)
5. It is understood that in such cases the priority at the outset of the investigation needs to centre around controlling and eradicating the risk to NZ. However, if there is the slightest indication that an enforcement investigation will be necessary then IDC and the Enforcement Directorate should work hand in hand from the outset to ensure that no evidence is lost and that all lines of investigation are covered.

For the case in hand the following actions are examples of what could have been completed at an early stage of an investigation where Enforcement is a consideration but may not necessarily be of paramount importance to IDC containment and eradication:

- Lab coats used in the PC2 were autoclaved at an early date without examination. With humans being identified as a possible pathway the lab coats may have offered further evidence to either support or refute this hypothesis.
- Extractor fan mesh was not initially examined for evidence of seeds. With the fans being identified as a possible pathway an examination may have offered further evidence to either support or refute this hypothesis.
- A grassed area adjacent to where scientists from Lincoln University parked when they came and went from the PC2 was not included in the initial scanning to establish the extent of the breach. With the human pathway being considered a possible cause of the breach, and for the fullness of the investigation it may be considered useful to have this area examined.
- A water pathway was identified months after the initial breach notification which was not noted in the initial assessment reports. With supporting

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comments from the _____ who actually ran the experiment and taking into account the proximity of the positive plants to the leaking walls, I am leaning towards this being the most likely pathway of escape.

The above points do all link to pathway identification which is a crucial element in any subsequent prosecution especially when considering offences under the Biosecurity Act of "Causing a restricted organism to leave a containment facility" i.e.: if you cant prove the pathway then you will no doubt struggle to prove that someone caused or permitted a breach via that pathway.

6. Audit reports (*Appendix 8*) of the PC2 facility are signed off with a paragraph which includes the words

"I am satisfied that you are currently operating in compliance with MAFBNZ Standards Containment Facility for Plants 2007, 154.02.08. Therefore I am recommending to MAF Biosecurity New Zealand that they continue your approval to these standards."

This wording is found at the conclusion of the report despite the fact that numerous Corrective Actions may be included in the audit which the operators are bound to comply with within a certain time frame to prevent the facility being closed down.

If we are to retrospectively prosecute for breach of containment facility conditions we may struggle if we are issuing audit reports stating that they are "Operating in compliance with MAFBNZ Standards".

Once corrective actions, which are essentially a breach of standards and a possible criminal offence, are issued to a containment facility operator there is no physical follow up to ensure corrective actions have been complete. We simply take the operators word for it that the work has been done and the facility is again compliant. In such high profile cases such as GM containment it may be worthy of consideration to carry out follow up inspections to ensure corrective actions have been complied with (see *Appendix 9*).

It may be more prudent to issue a report highlighting the outcomes of the audit along with corrective actions and conclude the report by saying something along the lines of, "Once you have complied with the corrective actions you will be reassessed to establish if you are operating in compliance with MAFBNZ standards".

7. For the case in hand Lincoln University imported two separate consignments of GM seeds from America. Although the import permit (*Appendix 2*) for the first consignment lists GMO *Arabidopsis thaliana* seeds the BACC clearance when the seeds arrive in the country list the clearance for "Non transgenic *Arabidopsis thaliana* seeds" (*Appendix 3*). Clearly the seeds are transgenic so it may transpire that the original BACC clearance was inaccurate and technically the first consignment of seeds were never cleared by means of BACC to enter the country.



8. The original ERMA approval (*Appendix 1*) documentation authorising the GM work on the *Arabidopsis* seeds includes the wording in the conditions:

"Whilst all precautions for the prevention of escape and establishment of population of transgenic *Arabidopsis* will be taken there remains a small risk that a population of escaped plants may establish. Should genetically modified *Arabidopsis* population establish, they would be susceptible to common herbicides such as glyphosphate (Roundup). Routine procedures at the Crop and Food PC2 glasshouse facility routinely involves weed control around the glasshouse facility."

This wording is particularly unhelpful to a prosecution case and is more descriptive than directional. Comments on this condition and more suitable wording are included in the main investigation summary document.

9. The original ERMA approval (*Appendix 1*) documentation authorising the GM work on the *Arabidopsis* seeds includes the wording in the conditions:

"Sturdy paper bags or seed collection vessels will be placed on the plants to prevent the spread of pollen and seed and facilitate the collection of seed for further analysis"

P&F were under the impression that the seed collection vessels in use by Lincoln University were "Aracon" seed collection tubes. Aracon tubes are about 40 cm high and have asymmetrically placed ventilation holes for aeration along the length of the tube. Parts of *Arabidopsis* plants in other experiments at the PC2 (not the one in question) have been observed to be growing through the holes in the Aracon tubes and there remains a question if these tubes are fit for purpose in "PREVENTING the spread of pollen and seed" as specified in the conditions. As it transpires Lincoln University have said that they were using paper bags and not the Aracon tubes but it may be considered prudent in future conditions to be more descriptive around the seed collection vessels to be used and to establish that they are in fact fit for purpose.

10. The original ERMA approval documentation (*Appendix 1*) authorising the GM work on the *Arabidopsis* seeds includes the wording in the conditions:

"All waste and plant material will be autoclaved for 15 minutes"

The current setup at P&F in the PC2 allows for any plant waste from watering to simply wash down the drain, through a mesh filter and into the storm drain. The mesh filter has an aperture size larger than the seed size of the *Arabidopsis* plant seed. There are two points of note here:

- It may be worth giving consideration to the ERMA approval conditions wording around the meaning of "waste" to ensure it encapsulates plant waste in the water.
- Despite the fact that the PC2 at P&F has been audited as compliant it may be worth considering if water leaving the facility should be treated if there is a potential for it to carry plant material. It is of interest that the Lincoln University "Biotron" manual, which is a user guide to their own in house containment facility, makes mention of

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plant watering and the treatment of the subsequent waste water yet at the P&F PC2 facility waste water was simply allowed to run into the storm drain after passing through a mesh filter.

11. The certificate of approval (*Appendix 4*) as a containment facility for the P&F PC2 lists the inspection period as "Six Monthly" in accordance with the New Zealand Standard: Containment Facilities for Plants. However, I have been advised that inspections are being carried out annually which is in accordance with the standard. It seems the certificate and the standards are at odds.
12. Once corrective actions, which are essentially a breach of standards and a possible criminal offence, are issued to a containment facility operator there is no physical follow up to ensure corrective actions have been complete. We simply take the operators word for it that the work has been done and the facility is again compliant. In such high profile cases such as GM containment it may be worthy of consideration to carry out follow up inspections to ensure corrective actions have been complied with (see *Appendix 9*).
13. In the middle of this investigation I established that the ERMA conditions had actually been changed (*Appendix 5*). Original conditions had been removed and others had been altered. There may have been a consultation process around these amendments but I am not aware of one and as the lead investigator it would have been nice to know of any changes. Subsequent legal action can also be effected by such changes i.e. if we were looking to prosecute for breach of a condition in the original approval but that condition was subsequently removed in the latter amendment the defence would no doubt question if the condition was necessary in the first place.
14. The import permit number 2006030049 for the first batch of seeds (*Appendix 2*) states under the heading special conditions that the import must be in accordance with ERMA Application GMC99006 and GMC05017. These appear to be the wrong application codes. The application code for the experiment in question was GMD05103. One would imagine it was this code that should be sited on the bottom of the import permits as opposed to the two unrelated codes that are listed. Such errors would raise questions over the validity of the original import permits.

Research on codes GMC99006 and GMC05017 (*Appendix 6*) shows that GMC99006 relates to an application made by Massey University to import transgenic *Arabidopsis thaliana* seeds and application GMC05017 relates to an application by the University of Otago to import transgenic *Arabidopsis* seeds. These incorrect codes are also listed on the second import permit which may also subsequently invalidate the second permit (*Appendix 7*).