UNIVERSITY OF QUEENSLAND
OCCUPATIONAL HEALTH AND SAFETY DIVISION

Questions proposed by the OGTR

1. **Which option/s do you support, and why?**

Support for Option 4:

The definitions of GMOs and gene technology in the Gene Technology Act 2000 specify exclusions to these definitions (see Appendix 1, Gene Technology Act 2000). Techniques that are not regarded as gene technologies under the Gene Technology Act 2000 include the following induced mutagenesis approaches:

- Electromagnetic radiation induced mutagenesis.
- Particle radiation induced mutagenesis.
- Chemical induced mutagenesis.

Organisms produced by these induced mutagenesis approaches are not considered GMOs under the Gene Technology Act 2000.

CRISPR and other site-directed nuclease (SDN) techniques involve introduction of transgenes composed of foreign and/or synthetic DNA to create site-directed, double-stranded breaks. This can subsequently result in site-directed mutations due to unguided repair of the targeted double-stranded break, producing sequence changes that are very similar to those produced by natural or induced mutagenesis.

Organisms that carry transgenes composed of foreign and/or synthetic DNA for inducing site-directed, double-stranded breaks should be considered a GMO under the Gene Technology Act 2000. However, when these transgenes are segregated away in subsequent generations, the resulting organisms will carry a mutant gene very similar to a mutant gene produced by natural and induced mutagenesis, but no foreign DNA. To be consistent with exclusions already listed in Appendix 1 of the Gene Technology Act 2000, these organisms that carry no foreign DNA but an SDN-induced mutation should not be considered as GMOs.

Option 4 focuses on the ***outcomes*** that are produced from genetic manipulation. These are likely to be organism specific. Plants and animals are not infectious agents but for microbes (especially known pathogens) there would be some concern that a modification of a gene could be undertaken that would make the microbe more pathogenic/virulent. So for microbes (especially known infectious microorganisms) the potential outcomes mean that they should be subject to regulation. However, plants and animals that may not be a risk in the laboratory should be subject to regulation where there is any proposed field release.

Thus, Option 4 allows for a flexible regulatory framework that takes into account the technology that is being used, the nature of the organism that is being genetically manipulated and the potential outcome. This would mean that as new technologies emerge, they are assessed within a risk-based framework. This also means that the IBC will have some input on the assessments of the license requirements, whereby exempt dealings using CRISPR technology, for example, are just

recorded, but where a process that is DNIR/DIR in nature proceeds to further assessment, and approvals with both OGTR and IBC. Additionally, there are inherent risks in providing blanket exclusion to all processes using SDN-2. Therefore a number of conditions and regulatory oversight should be developed for this option. Such requirements can be achieved by consultation with experts in the field.

2. **Are there other risks and benefits of each option that are not identified in this document?**

Option 3 processes may be difficult to define and would subject some genetically identical organisms generated by distinct methods to different regulatory requirements. By defining the process this doesn't always give the desired outcome. For example, CRISPR technology can knock out, insert and perhaps even snip and re-arrange DNIR and achieve the same desired outcome.

3. **Is there any scientific evidence that any of options 2-4 would result in a level of regulation not commensurate with risks posed by gene technology?**

Option 2 could result in organisms that are completely indistinguishable from naturally occurring mutations being subjected to regulations that are applied to GMOs and therefore needing a license, when in fact they are no different from mutated species that are excluded under the Gene Technology Act 2000.

4. **How might options 2-4 change the regulatory burden on you from the gene technology regulatory scheme?**

The necessary infrastructure to deal with the applications is in place, however, it remains to be seen how widespread the use of the newly regulated techniques will be and what the associated additional workload will be. Clarity in the regulations will significantly contribute to keeping the workload manageable.

5. **How do you use item 1 of Schedule 1, and would it impact you if this item was changed?**

Defining terms should bring more clarity.

6. **Might contained laboratory research on GM gene drive organisms pose different risks to other contained research with GMOs, and how could these risks be managed? Supporting information and science-based arguments should be provided where possible.**

The review should consider case-by-case assessment of such work by the Regulator (i.e. as a licensable Dealing Not involving Intentional Release). If a GMO is intended for release at any date e.g. the example given of malaria in mosquitoes, then this type of work may produce additional risks and be more than just an NLRD. IBC already assesses this area and would approve of the clarity here on preference of gene drive technologies.

The likelihood of accidental transfer of genes from GM gene drive organism needs to be carefully assessed in the context of accidental transfer of genes from more ' conventional' GMOs. The use of GM gene drive organisms in planned release experiments will require additional safeguards.

7. **What RNA interference techniques are you using, and are there RNA interference techniques that you believe have unclear regulatory status? Please provide details of the techniques and science-based arguments for whether these techniques pose risks to human health or the environment.**

Currently we only have one use of RNA interference, to confer protection against plant pathogens. This application clearly defined the science as not a risk to allow the IBC to agree to the approval of NLRD. It is our understanding that it would not propose any additional risks than any other processes assessed at UQ for licensing.

8. **Do you have proposals for amendments to any other technical or scientific aspects of the GT Regulations? All proposals should be supported by a rationale and a science-based argument.**

Not at this time.

In Summary

UQ would like to support OGTR in its review in regulations and look forward to a quick decision to allow IBCs to proceed quickly with any new and pending applications with clearer direction in regards to assessments. Our preference leans towards Option 4 and we look forward to the clarity in the changes in legislation.