Technical Review of the Gene Technology Regulations 2001: Summary of submissions received on 2016 Discussion Paper

OGTR's Discussion Paper[1] consultation from October-December 2016 received 741 submissions, with 126 submissions received directly by OGTR and 615 made through a web form supplied by Friends of the Earth Australia on the Do Gooder website (referred to below as Do Gooder submissions). Individuals and organisations across Australia and from overseas made submissions, including:

- individuals, some of whom made multiple submissions
- universities, research institutes, hospitals and individual researchers
- agriculture-related companies and industry bodies, including plant and animal breeding, conventional agricultural production and organic agriculture
- other companies and industry bodies related to the food, medical and veterinary sectors
- State and Commonwealth Government agencies; and
- academics, non-government organisations and community groups.

This document contains a summary of the individual submissions available on the OGTR website, which provided varying degrees of substantiating information to support the views and arguments presented. OGTR views on the submissions and the merits of the arguments presented are not canvassed in this document.

Regulatory options for new technologies

The Discussion Paper outlined four options for how two specific site-directed nuclease techniques, SDN-1 and SDN-2, and ODM[2] could be regulated, and sought submitter views on the options, including seeking scientific evidence of risks. Some submitters did not identify a preferred option, and some supported multiple options.

Option 1

Option 1, to leave the legislation unchanged in relation to new technologies, was presented to ask whether stakeholders preferred the status quo to the other options. Option 1 was supported by only three submitters, who considered that the current legislation clearly captures new technologies.

> *"…we see no need to amend GT Regulations as they already appear to capture 'new' technologies."* Walter and Eliza Hall Institute of Medical Research

Option 2

Option 2 was to regulate organisms modified using the three new technologies as GMOs. This option was supported by 56 individuals (four of whom made two

[1] For further information about the Discussion Paper consultation see the OGTR website.

[2] For information on SDN-1, SDN-2 and ODM techniques, refer to the Discussion Paper

submissions) and 12 submissions from a mixture of research organisations, non-government organisations and government agencies. While less than 10% of Do Gooder submissions explicitly supported option 2, approximately 40% supported strict regulation of all new technologies.

On the whole these submitters considered that a cautious approach was warranted for these technologies, and that unregulated use should only proceed once safety is proven.

Prominent concerns amongst these submitters were that there is not enough knowledge to fully understand how these techniques work and to be confident about the risks posed by organisms modified using these techniques, including through off-target effects:

> *"Genome editing techniques are far too new to have a history of safe use and claims about their precision is currently based on assumptions and remains to be scientifically demonstrated or proven."* Fern Wickson

> *"Although regulating these technologies may not be commensurate with the risk posed by the technologies and may have commercial implications, we support a cautious approach to regulating new technologies because there are still unknowns and off-target concerns that require consideration."*
>
> University of Melbourne

Submitters' broader views of what a GMO is and the role of regulation were also an element of their preference:

> *"These processes are definitely genetic engineering processes. They result in a GMO because they are not natural processes."*
>
> *The Sustainable Agriculture & Communities Alliance*

> *"We recommend option 2 because the amendment for these processes is consistent with the general precautionary approach set out under the Act."*
>
> Centre for Law and Genetics

> *"For our IBC, one of the key benefits of the current regulatory scheme is that it prompts our stakeholders to stop and think through the work they have planned and the risks associated with it."* University of Melbourne

Many of the Do Gooder submitters stated they supported option 2 because it would "require the labelling and safety testing of all products derived from new GM techniques". However, regulation of the non-viable products of GMOs is beyond the scope of the gene technology regulatory scheme, and is the remit of other agencies including Food Standards Australia New Zealand, the Therapeutic Goods Administration and the Australian Pesticides and Veterinary Medicines Authority.

Some submitters raised broad concerns about the risks posed by GMOs and new technologies:

> *"Entirely new diseases and poisons could be made. And they could enter our food chain and our environment with no safety testing and no labelling. The results could be catastrophic."* Friends of the Earth Australia, Gene Ethics , GM-free Australia Alliance, MADGE and GM Cropwatch (combined submission) and 46 individual submitters

Many submitters supporting options 3 and 4 expressed concern that option 2 would require regulation of broad groups of organisms that cannot be empirically distinguished from those derived from non-gene technology techniques. Some submitters speculated that this could put a substantial burden on those needing to prove the provenance of an organism. Alternately, one option 2 supporter suggested introducing additional requirements to enable detection of these organisms:

> *"…a requirement for some kind of watermarking could be put in place to ensure their detectability. Or indeed, a requirement that detection methods were developed alongside the advance of the applications."* Fern Wickson

Importantly, the ability to detect small sequence changes is already well established, however detection does not provide proof of how small sequence changes came about.

Option 3

Option 3 was to regulate organisms modified using template-directed techniques (ODM and SDN-2), and exclude organisms modified using SDN-1 from regulation. This option was supported by 17 submitters, including 12 research organisations. These submitters generally viewed this option as a suitable balance between enabling innovation and appropriate regulation, and most consistent with the current policy settings:

> *"DPI considers that option 3 provides an appropriate balance between enabling advances and ensuring regulatory control…"*
>
> NSW Department of Primary Industries

> *"Of the four options, the IBC supports option 3 … as it is considered to be most likely to: … fit within the current policy setting of the Gene Technology Act, which is not the subject of the review (i.e. it is compatible with the process-triggered definition of 'GMO' in the Act). "* Royal Prince Alfred Hospital IBC

Submitters supporting option 3 generally considered organisms modified using SDN-1 to be as safe as organisms produced with non-gene technology techniques. They highlighted that organisms modified using SDN-1 carry equivalent genetic changes to those produced by mutagenesis, and so do not pose different risks. Some suggested that, SDN-1 being more targeted than mutagenesis, it may pose lesser risks:

> *"…the fact that SDN-1 is site-directed makes it a controlled process and as such organisms generated by SDN-1 are inherently superior or safer than organisms generated by the purely random mutagenesis approaches which are currently not regulated."* SA Pathology IBC

Some submitters thought reconsideration of the process-triggered definition of "genetically modified organism" in the GT Act was necessary in the longer term, but supported option 3 in the Regulations Review because they felt that option was most consistent with the current policy settings.

Option 4

Option 4 was to exclude organisms modified by SDN-1, SDN-2 and ODM from regulation, on the basis that the genetic changes they carry are similar to or

indistinguishable from the products of conventional breeding. Option 4 was supported by 48 submitters, including 14 research organisations, 14 industry organisations and 10 companies.

Many option 4 supporters noted that genetically identical organisms could be derived by natural mutations, mutagenesis approaches and each of the new technologies. They considered that because all of these organisms pose the same risk they should have the same regulatory status regardless of how they were derived, and option 4 best achieved this. Many also considered only option 4 was practical in terms enforceability, as detectability is necessary to enforce compliance:

> *"Plants and animals developed through new technologies should not be differentially regulated if they are similar to, or indistinguishable from, those that could have been produced through earlier breeding methods…"* AusBiotech

> *"The regulations should exclude organisms indistinguishable from those generated by non-GM techniques such as chemical or radiation mutagenesis because they do not pose risks different to organisms generated by non-GM techniques and because they cannot be readily identified as having a history of genetic modification, making their regulation both futile and difficult."*
>
> Australian National University IBC

Similar to the views of option 3 supporters in relation to SDN-1, many option 4 supporters highlighted that SDN-1, SDN-2 and ODM are more specific and targeted than mutagenesis and much less prone to off-target effects. They also referred to the rapid improvements in specificity of SDN techniques published in the recent scientific literature:

> *"The scientific literature demonstrates that technologies such as SDN-1, SDN-2 and ODM offer potentially lower risk to human health safety and the environment than traditional mutagenesis techniques that have a long history of safe use."* La Trobe University IBC

A range of option 4 supporters, particularly companies and industry organisations, considered that option 4 would best support innovation and uptake of new technologies.

> *"Both Academies consider that Option 4: exclude certain new technologies from regulation on the basis of the outcomes they produce, to be the most effective means of accommodating new, precision technology, without limiting innovation and further developments in this area, and that this option provides an appropriate level of regulation."*
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> Australian Academy of Science and Australian Academy of Technology and Engineering (combined submission)

The Discussion Paper noted that, due to the constraints of the current policy settings, option 4 was limited to excluding specific techniques or organisms and could not focus on properties of the final organism. However, many option 4 supporters either interpreted this option to be a general exclusion for all organisms with equivalent modifications, or proposed its scope be extended in this way. Some submitters went further still and proposed option 4 be further extended so as to exclude from regulation any outcomes theoretically possible through techniques that are not gene technology, even if they were produced using gene technology, for example cisgenesis.

Approximately half of research sector submitters who supported option 4 raised concerns about uniform application of option 4 across all organisms, as this could exclude from regulation some organisms posing a level of risk warranting regulation. For example, submitters proposed option 4 should apply to plants but not microbes (CSIRO and Curtin University IBC), or only to plants and animals in contained facilities (University of Queensland IBC). Others suggested particular risk triggers should apply, such as increased pathogenicity or toxicity (La Trobe IBC). The concern that some groups of potentially risky organisms would not be regulated under option 4 was the basis for some submitters supporting option 3 instead.

Some submitters were concerned that, under option 4, repeated application of template-guided methods could generate substantial modifications that escaped regulation, but potentially posed risks warranting regulatory oversight. One submission also expressed this concern in relation to repeated application of SDN-1. However, other submitters indicated to OGTR through follow-up discussions that the theoretical possibilities of extended application of SDN-1 are not practically achievable, given the resources and prolonged time necessary. The extent of screening, SDN design and SDN application make it unrealistic that this approach would be used in the way described.

Several lines of reasoning were used to support each of options 2, 3 and 4 by various submitters, in differing forms. For example, different submitters felt that each of options 2, 3 and 4 was most consistent with the positions of overseas jurisdictions, and so best supported trade. Supporters of each of these options expressed concern about the clarity possible through implementing the other options, and felt their chosen option would be easiest to interpret.

Schedule 1 Item 1

The Discussion Paper noted that Schedule 1 item 1 of the GT Regulations, which is currently a source of much uncertainty, may need to be changed to improve clarity of the legislation. A consultation question sought information about submitters using item 1 in its current form, and no submitters identified clear uses. Many submitters responded to the consultation question with discussion of how item 1 could be interpreted and how it could be amended to implement their preferred option.

Gene drives

The Discussion Paper sought views on whether contained laboratory research on GM gene drive organisms poses different risks to other contained research with GMOs, and how these risks could be managed. Approximately one third of submissions directly received by OGTR included comment on gene drives.

Submitters expressed divergent views on this question, with some considering that current laboratory risk management is sufficient to contain GM gene drive organisms, some arguing for higher containment or case-by-case assessment of some or all gene drive GMOs, and some calling for a halt to all gene drive research:

> *“We believe the risk posed by laboratory research on GM gene drive organisms is similar to other contained research with GMOs that confer a selective advantage and this is presently captured by GT Regulations.”* CSL Ltd

> *"Research involving GM gene drive need to be assessed and considered on a case by case basis. If the GM gene drive organism posed an increased risk then additional containment requirements may be applicable, but if the risk was assessed to be the same or similar to that of other contained research with GMOs, then the containment requirements should be the same."*
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> University of Melbourne

> *"Overall, the risks to the environment of using gene drives could be managed by developing and using a threshold to determine when an NLRD should become a DNIR…A gene drive with the potential to spread in a local environment in the event of an unintentional release should require DNIR approval because of the increased risk to the environment."*
>
> Australian National University IBC

> *"Strict laboratory handling and containment rules for all gene drive research should be internationally agreed upon, and put into practice, before further research proceeds, even in the lab. An immediate, international halt to gene drive releases and experimentation is necessary until such a framework is put in place globally under relevant, enforceable international instruments such as the Cartagena Biosafety Protocol."* Friends of the Earth Australia, Gene Ethics , GM-free Australia Alliance, MADGE and GM Cropwatch (combined submission)

RNA interference

The Discussion Paper sought information on what RNA interference (RNAi) techniques are in use, and whether submitters considered any RNAi techniques have unclear regulatory status. Approximately one third of submissions directly received by OGTR included comment on RNAi.

A majority of these submitters did not provide detailed information of the RNAi techniques they are currently using; however, submissions did indicate that a wide variety of RNAi techniques are currently being used, including short interfering RNAs, short hairpin RNAs, double-stranded RNAs and artificial microRNAs. The nucleotide sequences of the RNAs may or may not match completely those already present within the organism into which the RNA is introduced. The RNA can be delivered in a number of ways, e.g. as naked RNA, non-vector mediated, vector-mediated or in a transgene construct.

Submitters expressed differing views as to the regulatory status of some RNAi techniques involving direct application of RNA, and some stated that more clarity regarding the regulatory status of RNAi was needed:

> *"Researchers feel that the regulatory status of RNA interference techniques is unclear. There has been confusion arising from the apparent de-regulation of some of these techniques when used in whole animals or humans, as implied under Schedule 1, Item 2. For researchers, this appears to create a level of regulation that is not commensurate with risk for research conducted in, for example, cultured cell lines if the equivalent research conducted in a whole animal or human is non-regulated."* Flinders University

Submitters did not consider there is ambiguity about the regulatory status of RNAi techniques employing viral vectors and genomic insertions – these were consistently considered to be within the scope of regulation.

Additional issues raised by individual submitters

None of the Do Gooder submissions directly addressed the consultation questions, and only 54 of the 615 Do Gooder submissions identified a preferred option. There were also general misunderstandings in Do Gooder submissions that the current review proposes a deregulation of all GMOs or all new technologies (i.e. beyond those under consideration in the review). Thirty one submissions initially received via the Do Gooder web form were later received directly with identical content.

Many of these submitters focussed on issues beyond the scope of the current review, including general opposition to the use of gene technology and concerns about corporate control of food production. Approximately two thirds of Do Gooder submissions supported stronger regulation of all GMOs and approximately a quarter voiced a general opposition to gene technology. Approximately 25% of Do Gooder submitters were concerned about corporate influences and their interest in profits over health.

Almost two thirds of Do Gooder submissions raised issues related to GM food, with almost 40% strongly opposed to GM food and more than 50% stating better GM food labelling was needed. Do Gooder submitters were also concerned about transparency for consumers if new technologies were excluded from regulation, particularly that consumers would have no choice to avoid foods produced using new technologies. Regulation of GM food, including labelling, is beyond the scope of the gene technology regulatory scheme. Amendments to the GT Regulations would not change the pre-market approval or labelling requirements for genetically modified (GM) foods and ingredients in Standard 1.5.2 – Food produced using gene technology in the Australia New Zealand Food Standards Code (the Code), which is administered by Food Standards Australia New Zealand.

Approximately 15% of Do Gooder submitters expressed concern that anyone, including biohackers or terror groups, would be able to use new technologies if they were not regulated under the GT Act. However, accessibility of information about these technologies and materials to use these technologies will not be altered by whether or not organisms modified using these techniques are regulated as GMOs.