Written Evidence submitted on behalf of the Nuffield Council on Bioethics (GTB09)

Genetic Technology (Precision Breeding) Bill

Summary of main points

- Further controls are required on the release of precision animals where a marketing authorisation would not be sought (paragraph 15).
- The focus on individual traits detracts from the assessment of animal welfare as the result of the interaction of complex biological and environmental factors, which should be taken into account by the Welfare Advisory Body (paragraph 16).
- The purposes and aims of precision breeding should be stated in the legislation to provide a framework for the elaboration and application of standards (paragraph 22).
- Precision-bred products should be labelled as such to enable consumer preferences to be signalled to industry (paragraph 24).

Introduction

1. The Nuffield Council on Bioethics is a leading independent policy and research centre, and the UK's foremost bioethics body. We identify, analyse, and advise on ethical issues in biological science and health so that decisions in these areas benefit people and society. For over thirty years we have tackled some of the most complex and controversial bioethical issues facing society.
2. In 2016 we published a report, *Genome editing: an ethical review*, that explored potential applications of prospective genome editing technologies, including crop plants, and farmed and wild animals, and identified areas that required further examination.[1] This led us to undertake a major inquiry into genome editing in farmed animals, which led to the report, *Genome editing and farmed animal breeding: social and ethical issues*, published in December 2021.[2]
3. Our submission draws on the research, and engagement with experts and members of the public that informed these two reports. However, our specific comments relate to the provisions in the Bill dealing with precision bred animals and, for the most part, precision bred farmed animals.

Part I – The appropriateness of the Bill

4. ‘Precision breeding’, as described in the Bill, marks out a subset of applications of genome editing and related techniques. Genome editing encompasses a set of powerful biological techniques, which it is anticipated will form the foundation of a range of prospective biotechnologies.

5. Genetic technologies have the potential to accelerate genetic gain and to make possible gains that were, until recently, unachievable, whether for biological or contingent (*e.g.* commercial) reasons. Given the significant potential implications of genetic gain, in animal breeding particularly, we agree with the implicit acknowledgement that precision bred organisms should be controlled through measures provided in law (rather than deregulated entirely).

6. We recognise that the Bill is intended to enable the development and innovation of beneficial new biotechnologies, making use of the deregulatory possibilities following the United Kingdom’s departure from European Union. We do not find the existing EU regime to be fit for purpose and therefore support the Government’s aim of finding a proportionate replacement. Indeed, we believe that the UK now has an opportunity to elaborate an exemplary, world-leading approach to governance that will encourage the evolution of a national food and farming system in the public interest, and provide global leadership in this area.

Part II – the approach to governance

7. The Bill is the Genetic Technology (Precision Breeding) Bill, yet it does not seek to control precision breeding directly; instead, as the long title clarifies, insofar as it controls precision breeding, it does so through the anticipation of conditions that must be satisfied in order to release precision bred organisms into the environment and to make them available or place them on the market.

8. In the UK, the development of precision bred animals is generally subject to the provisions of the Animals (Scientific Procedures) Act 1986 (‘ASPA’) and licensed accordingly. The provisions of ASPA are engaged by the potential for harms of a kind specified in section 2(1) of that Act. While many of the procedures ancillary to genome editing (*e.g.* the use of cell nuclear transfer – cloning – techniques) may be taken to entail a risk of such harm, it is not otherwise established that precision bred animals or their progenitors in England must have been bred in pursuance of an ASPA licence and that they may therefore enter commercial breeding only following confirmation that their genotype is stable and the phenotype (the animal’s ostensible biological characteristics) not compromised.[3] The relationship between the rehoming provisions of ASPA and the requirements relating to precision bred animals should be made clear, in particular in relation to when an animal’s genome is to be regarded as stable and when it may be made available on the market.[4]

9. Precision breeding affects animals' inherent constitutional capacities. The welfare of animals is not a characteristic, like growth rate or milk yield, but a consequence of the interaction of biological and environmental factors. Control over biological factors allows domesticated animals to be better fitted for certain purposes, environmental conditions and farming practices. It is imperative, in our view, that appreciation of this complex interaction underpins the authorisations provided for in the Bill, which should have the purpose of ensuring that a precision bred animal is capable of enjoying a good quality of life.[5] There is a risk that the focus placed on individual traits in the Bill could distract from this broader consideration of welfare.

10. The approach taken to the control of 'precision bred organisms', privileges the initiative of breeders. This means that the required determinations are reactive rather than anticipatory. No explicit standards are defined in advance, nor any aims prescribed, for the controlled activities. A first concern is without norms that are defined prior to and independently of applications there could be a progressive and insidious erosion of standards or neglect of important dimensions. [6]

11. A second concern arises from the fact that the governance arrangements set out in the Bill are to be given effect through procedures of notification and authorisation that are centred on formal determinations of the Secretary of State for the Environment, Food and Rural Affairs.[7] These determinations are to be supported by advice from several sources, generally standing committees of appointed experts with different remits and responsibilities. We are concerned that this arrangement creates the potential for the weight given to evidence and advice informing the ministerial determinations to be unclear.

12. As currently drafted, much of the detail concerning the constitution and operation of the governance system (*e.g.* the identity and composition of the bodies providing advice, their powers, their competence, relation and interaction) remains to be established or clarified through subsequent Regulations. This means that the Bill must be debated under significant uncertainty about the robustness of the proposed system. Furthermore, in few cases is there an obligation on the Secretary of State to make Regulations with specific effect (*i.e.* the language says the Secretary of State 'may' rather than 'must' make Regulations'). We highlight below instances in which, as a minimum, the Secretary of State should be required to make Regulations.

13. We are aware that Defra is in the process of reviewing its advisory frameworks but it is unfortunate, in our view, that concrete governance arrangements could not have been proposed in Schedules to the Bill, so that they might be scrutinised and debated during its passage through Parliament. We believe that subsequent Regulations should provide for the advisory function in relation to precision bred animals to be exercised by a single, suitably empowered and resourced body

(the nominated Welfare Advisory Body) that should operate openly and independently.

Part III – Comments in relation to specific draft provisions of the Bill

Release of precision bred organisms

14. The definition of a 'precision bred organism' (clause 1) is not restricted to organisms bred for purposes of agricultural and aquaculture. In carving out precision bred organisms from the controls on deliberate release that apply to genetically modified organisms under retained EU regulations, precision bred organisms may be released without being placed on the market, subject only to notification provisions (clause 4). On our reading of the Bill, this means that precision bred animals that are not transgenic organisms, may be released without further authorisation, without even a 'precision bred confirmation'. Such releases could have significant effects on existing ecosystems (for example, if they should have a reproductive advantage over wild organisms of the same species) .[8] This may be a matter of significant concern to other UK and wider jurisdictions as such animals may travel freely across jurisdictional boundaries.

15. At the very least, we would welcome the reassurance of a minimum prescribed period set out in primary legislation (rather than Regulations as provided in clause 4(1)(b)) during which information about the proposed release could be published on the clause 18 register, evidence considered, representations received, advice taken and, if appropriate, a stop notice issued. However, the lack of a prior authorisation procedure for environmental release limits the purchase of the enforcement provisions of part 4 of the Bill (which are engaged by a breach of part 2 or part 3 obligations). We therefore urge that provision is made in the Bill for compliance notices and stop notices to be issued in respect of notified releases, regardless of compliance with part 2 or part 3 obligations.

Traits and pleiotropy

16. Clause 1(6) says that "In determining whether a feature of an organism's genome could have resulted from natural transformation, no account is to be taken of genetic material which does not result in a functional protein". The intention of this provision is unclear to us, though it could be taken to imply that an off-target event could be ignored so long as it did not result in a functional protein even if it were to have an effect on gene function. In general, the focus of the provisions is on demonstrating the relation between a given molecular intervention and the intended observable trait, possibly neglecting unintended pleiotropic effects that may result from the interventions. Furthermore, in the case of animals especially, it is not the presence or absence of the individual trait but the balance of traits in the animal and their interaction with environmental conditions that contributes to the animal's overall welfare.

Welfare of individual animal v. breed welfare

17. As indicated above, we welcome the fact that provisions are made to secure animal welfare in the Bill. We particularly welcome the implicit recognition that welfare is distinct from, though in many cases related to, health. Assessment of animal welfare is a developing area of research and developments in this interdisciplinary field should be incorporated into the assessment of animal welfare declarations.

18. Clause 11 concerns marketing notices in respect of a 'relevant animal'. As currently drafted, it is unclear whether such notices and related authorisations apply to an individual animal (token) and its qualifying progeny, or a variety of animal with a particular precision bred trait (type), that is, whether they operate case-by-case or class-by-class. The latter may introduce uncertainty to the extent that the genetic background (the genome) into which the alteration is introduced may differ from one animal to another and give rise to different outcomes. Outcomes may also differ because of gene-environment interactions (and therefore environmental conditions), which will be relevant to the assessment supporting the animal welfare declaration required by clause 11(3).

Assessing animal welfare

19. The animal welfare declaration required by clause 11(3) must be referred to the Welfare Advisory Body (clause 11(6)), which may be specified in Regulations. We take this to imply that no declaration can be considered until those Regulations are made and the body established. The constitution and composition of this body will be of great significance. As a minimum, we would expect such a body to encompass a variety of relevant expertise and be able to demonstrate sufficient independence from declarable interests in animal breeding, particularly as it is likely to have to handle commercially confidential information to discharge its function. We suggest that the making of Regulations to this effect be obligatory rather than optional.

20. We would draw attention to the difference between discrete, qualitative gains through introducing or removing phenotypic traits (such as disease resistance, or hornlessness in cattle) and incremental, quantitative changes (such as improvements in growth rate, feed conversion, milk yield) where continual genetic gains may be achievable. Many currently proposed uses of precision breeding fall into the first category and could contribute positively to animal welfare given the appropriate circumstances.[9] The impact of these changes may be more easily assessed case-by-case than that of incremental gains, though the latter may, in future, also become objectives of precision breeding.

21. A difficulty with the proposed procedure for assessing animal welfare (as well as assessments under existing legislation) is that it provides little purchase for the assessment of the welfare impact of the second category (of incremental

changes), where the problem lies not in the trait itself but the trajectory of breeding. What makes this particularly difficult in the absence of normative standards in the context of continual evolution of breed norms in relation to a range of characteristics that are targeted in breeding programmes (or that are affected as a consequence).[10]

Benefits of a framework and normative standards for precision bred animals

22. A possible remedy for this may be found in Regulations under clause 25. These could be used to set certain breeding standards and could, potentially, be used to give effect to the kind of 'traffic light' system we proposed in our 2021 report.[11] However, the proposed process, involving affirmative regulations, is cumbersome. Furthermore, the approach taken is unambitious it focuses principally on the avoidance of harms rather than the achievement of aims that promote the public good. We propose grasping the available opportunity to set out desirable aims for precision breeding on the face of the legislation.[12] As indicated, this requires bringing together the relevant factors, many of which are present in but diffused through the Bill or promised in Regulations.[13]

23. Making aims of precision breeding explicit on the face of the legislation would have two virtues. First, it would signal that precision breeding should be directed to achieving positive outcomes that negotiate complex and interacting aims. Second, setting out positive aims in this way would also provide a framework for the elaboration of more specific normative standards in relation to different species and farming practices by the Welfare Advisory Body. It would do this both in the light of data obtained from applicants and through systematic consideration of relevant emerging research (for example, research on relevant measure of farmed animal welfare).[14] This would provide a more robust and transparent basis for assessment of welfare declarations than the proposed approach of, in effect, simply quality-assuring submitted declarations. We believe this high-level framework could be set out in the conditions for grant of marketing authorisations, say, in a new provision in clause 13, or in a Schedule (subject to amendment by Regulations).[15]

Labelling of products

24. In the case of food and feed deriving from precision bred organisms, requirements may be imposed by Regulations to ensure traceability, safety, nutrition, and honesty in marketing (clause 26). We note that there is no requirement nor any present intention that genome edited products should be labelled as such. We are concerned that this runs contrary to the findings of many public engagement initiatives that have broached this question.[16] It is particularly troubling considering the general approach of allowing the uses of biotechnology to be shaped by industry and the market: in this context, not labelling amounts to the withholding of information about consumer preferences (expressed through decisions to purchase or not purchase what they believe to

be genome edited products). The consequence is that information that many people would wish to inform the system of agricultural production is simply removed from the signals that are fed back through the market. Regulations under clause 26(2)(b) to ensure traceability must be made to secure the possibility of labelling. As others have pointed out, not requiring labelling may have the effect of simply encouraging other producers to label their producers as 'not genetically altered'.

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25. We remain at the disposal of the Genetic Technology (Precision Breeding) Bill Committee to provide clarification or further elaboration of any of the points made in this submission.

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[1] Available at: https://www.nuffieldbioethics.org/publications/genome-editing-an-ethical-review.

[2] Available at: https://www.nuffieldbioethics.org/publications/genome-editing-and-farmed-animals

[3] A requirement for stability of the genome is present in clause 1(2)(b) of the Bill, but the reference to breeding by 'traditional processes' or 'natural transformation' in clause 1(2)(c) does not entail that the phenotype thus produced should not be detrimental to the animal's welfare.

[4] Under ASPA, the Secretary of State may grant permission for the rehoming of the progeny of experimental animals after a genetic alteration is shown to be stable after at least two generations; under the Bill, a marketing authorisation is required and obtainable in respect of a precision bred organism or its qualifying progeny (at the next generation).

[5] This was the approach long ago recommended by the Farm Animal Welfare Council (FAWC); see FAWC (2009) *Farm animal welfare in Great Britain: past, present and future*, available at: https://www.gov.uk/government/publications/fawc-report-on-farm-animal-welfare-in-great-britain-past-present-and-future.

[6] The standards set by Defra in its 'on-farm welfare' codes (https://www.gov.uk/topic/keeping-farmed-animals/animal-welfare) are relevant, though they may be disregarded in practice. Linking compliance explicitly with the marketing authorisation would be a desirable step.

[7] An alternative approach would be the delegation of powers to an independent, competent authority.

[8] For an example, see the proposal to release genome edited white-footed mice in Nantucket to control Lyme disease (though in this case involving a gene drive construct): https://www.media.mit.edu/articles/in-an-effort-to-curb-lyme-disease-scientists-hope-to-release-thousands-of-genetically-altered-mice-on-nantucket/

[9] As the purpose of breeding is often to optimize an animal for particular husbandry conditions, these conditions are also a relevant factor in the welfare assessment. We caution, in particular, against uses of precision breeding that are intended to make animals better able to tolerate conditions of poor welfare (such as cramped or harsh conditions) without manifesting adverse health impacts. (See also out comments on the value of stating the positive aims of precision breeding.)

[10] This evolution of norms is implicitly expressed in the 'rebasing' of breeding indices (which indicate the degree of expected variation from a reference animal in certain measured dimensions). Extensive data relevant to these is held by commercial breeding companies, since they are critical to breed improvement. However, the composition of breeding indices (what traits are measured and how they are measured), and the interpretation of measurements are critical questions.

[11] Nuffield Council on Bioethics (2021) *Genome editing and farmed animal breeding: social and ethical issues* (London: NCOB; https://www.nuffieldbioethics.org/publications/genome-editing-and-farmed-animals), paragraph 6.55 ff.

[12] An example of a high-level statement of aims is provided by the definitions of responsible and sustainable breeding in the European Forum of Farm Animal Breeders' Code-EFABAR, which applies to all commercial farmed animal breeding (e.g. "contributing to the production of sufficient, safe, nutritious and healthy food whilst taking care of genetic diversity, resource efficiency, environment, animal health and animal welfare to create 'a better world' for future generations"); see https://www.effab.info/code-efabar.html (NB The Code is expected to be reviewed by 2023.) In formulating these aims we would urge the Government to take account of public views about the use of biotechnologies. In partnership with the UKRI Biotechnology and Biological Sciences Research Council and Sciencewise (the programme funded by UK Research and Innovation that aims to ensure policy is informed by the views and aspirations of the public), the Nuffield Council on Bioethics has recently commissioned a public dialogue initiative to explore public views on the potential role of genome editing in the future food and farming system.

[13] For example, the Bill cites: environmental protection (clause 17), animal welfare (clause 11 and Regulations under clause 25), food safety and nutrition (Regulations under clause 26).

[14] We would urge that the AWB should have the power and resources to commission research in areas in which existing knowledge is lacking (see recommendations in our report, cited above).

[15] Setting out the morally acceptable purposes for interventions in statute is an approach that is established in related contexts, for example in the case of human (as opposed to animal reproduction) in the UK. The legitimate purposes for the use of preimplantation testing, a technique used to select embryos with certain traits in assisted reproduction, are set out in the Human Fertilisation and Embryology Act 1990 (as amended), while the approval of new uses of the technology within this framework of purposes, is carried out through a licensing procedure by the Human Fertilisation and Embryology Authority.

[16] See, for example, the findings of Ipsos MORI (2021) *Consumer perceptions of genome edited food*, available at: https://www.food.gov.uk/research/researchprojects/consumer-perceptions-of-genome-edited-food.