Nuffield Council on Bioethics Inquiry: Genome Editing and Farmed Animals

Evidence from GM Freeze, submitted via email to animals@nuffieldbioethics.org

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INTRODUCTION AND SUMMARY

- GM Freeze is the UK's umbrella campaign for a responsible, fair and sustainable food system. Our members include organisations such as the Soil Association, Friends of the Earth, Scientists for Global Responsibility, Garden Organic, Action Against Allergy, farmers, retailers, scientists, grassroots campaigners and concerned individuals.

- There is growing evidence that genome editing is not as precise or targeted as those promoting it would have us believe.

- Many proposed applications of genome editing to farmed animals are likely to perpetuate and deepen the negative impacts of intensive farming.

- Public involvement in the development of policy and regulation of genome editing in farmed animals must be meaningful and broad ranging.

- We are concerned about the framing of the background and questions in the call for evidence to this inquiry.

GM Freeze, c/o Openspace Cooperative, Unit 1, 41 Old Birley Street, Hulme, Manchester M15 5RF
Tel: 0845 217 8992 **Email:** liz@gmfreeze.org **Web:** www.gmfreeze.org
Twitter: @GMFreeze **Facebook:** /GMFreezeUK

1. CURRENT RESEARCH

1.1. GM Freeze supports the evidence submitted to this inquiry by GeneWatch UK[1]. In particular, we request that this submission be noted as reiterating points raised by GeneWatch on:

- Misleading claims about what will be achievable with genome editing.
- The risk that animals genetically engineered to be resistant to a particular disease could create a hidden reservoir of infection and/or support the evolution of more virulent pathogens.
- The unacceptable levels of animal suffering that is an inevitable consequence of pursuing genetic engineering of animals, whether via transgenesis, genome editing or other methods.

1.2. Considering further the first issue listed under 1.1, above, one of the Call for Evidence questions asks: "What kinds of innovation does genome editing make possible (or practical) that selective breeding or transgenic modification techniques do not?". We are concerned that the phrasing of this question will invite speculation about hypothetical potential future applications of genome editing techniques for which there is little basis in current, active research. It is important to remember that similarly optimistic claims made about the transformative potential of transgenic techniques have not been realised, despite over twenty years of commercialisation.

1.3. A recent report by Friends of the Earth US[2] found that genome editing can cause genetic errors, interfere with gene regulation and produce abnormal proteins that could create new food allergies. We commend this detailed report to the council for consideration within the inquiry.

1.4. A recent peer reviewed study published in Nature Scientific Reports[3] found that genome edited mosquitoes, which were engineered to produce non-viable offspring, have in fact produced hybrid offspring that are now established within the local population.

1.5. In August 2019 it emerged[4] that the US Food and Drug Administration (FDA) had stumbled upon evidence that the DNA of genome edited hornless cattle had been changed in significant and unexpected ways that had been overlooked by both the developers and the Brazilian authorities that had approved commercialisation of the animals without further oversight. These unintended changes included the integration of antibiotic resistance marker genes which raises a particular concern in light of the global rise of antibiotic resistant infections. More fundamentally, this incident demonstrates the fallacy of claims to genome editing's precision and the importance of robust regulation incorporating comprehensive screening for unintended alterations.

1.6. In order to consider the use of genome editing in context, we urge the council to also consider research and development projects that are farmer-led and focus on agroecological approaches, as described in a letter to UK Ministers and Research Councils in February 2019.[5]

2. THE SOCIOECONOMIC CONTEXT

2.1. The groups or organisations likely to benefit most from the use of genome editing in farmed animals are the intellectual property owners that hold patents for the techniques used and/or for the animals themselves. GM Freeze believes that genetic resources are a public good that should not be controlled by any individual, group or company. We are, therefore, opposed to the patenting of farmed animals and other living organisms.

2.2. The people likely to be disadvantaged by the use of genome editing in farmed animals are the farmers, researchers and others working to develop agroecological responses to the challenges facing our food and farming system. These groups are already under-resourced[6] and any further development of genome editing in agriculture is likely to increase political and financial focus on projects that privilege technological invention over other forms of innovation and development.

2.3. The greatest disadvantage from the development and use of genome editing in farmed animals will be to the animals themselves. We support the detailed evidence submitted by GeneWatch UK[7] detailing the vast numbers of animals that have endured significant suffering in genome editing research carried out to date. GM Freeze is specifically opposed to the cloning of animals due to the great suffering that it causes. We also recognise that, while non-cloning techniques may reduce some welfare concerns directly related to the process of cloning, all methods of genetically engineering farmed animals cause unjustified and unacceptable suffering to sentient beings.

2.4. The background information in the call for evidence to this inquiry states that "Research is being carried out to find new ways to intensify food production sustainably in order to feed a growing population". We are concerned that this framing creates an inaccurate perception of need. We already grow enough food to feed the predicted peak world population of 10 billion[8] so production is not the problem. Around a third of food produced worldwide (approximately 1.3 billion tonnes) is lost or wasted[9] and that which is consumed is not distributed proportionately around the world. Put simply, people are not hungry because there is not enough food to go around, they are hungry because they are poor. A peer reviewed report found in 2017[10] that NGOs were particularly concerned about the use of a perceived crisis around food security as a justification for the use of genome editing.

2.5. The Scottish, Welsh and Northern Irish governments have taken all available steps to exclude the cultivation of GM crops on their territory[11] so we should expect significant disparity in the political approach to genome editing across the four nations of the UK. The right of the devolved nations to determine and oversee their own policy on all aspects of genetic engineering must not be undermined by Westminster-based enthusiasm for new technologies.

3. ETHICS

3.1. Many of the traits proposed for genome editing in farmed animals, such as polled cattle and disease resistance, are presented as welfare improvements. However, such traits would have the effect of masking the significant impacts of intensive animal agriculture. Rather than changing animals to fit the system, we must change the system to respect the needs and welfare of the animals employed within it.

3.2. Other proposed traits concentrating on commercially attractive outcomes such as increased muscle or more rapid growth raise serious animal welfare concerns of their own. Such concerns are not unique to genome editing but the potentially transformative nature of the genetic changes proposed represents a significant increase in the pace and potential impact of human-induced changes to the physiology, health and wellbeing of animals raised for food production.

3.3. As noted under 1.1. above and presented in detail in GeneWatch UK's evidence to this inquiry[12], the large number of animals involved in the development of genome editing projects, and the suffering caused by unsuccessful experiments, miscarriage, still birth and deformities raises a significant ethical concern about the application of this technology to farmed animals.

3.4. The heritability of both intended and unintended changes to the genome adds a significant ethical dimension to the consideration of these techniques. This concern is exponentially greater in the event of employing gene drives to overrule mendelian inheritance.

4. LAW, REGULATION AND POLICY

4.1. There is now wide recognition that our food and farming system must change if we are to overcome challenges including a climate emergency, reduced soil fertility and loss of biodiversity. We believe that these challenges can only be addressed by creating a responsible, fair and sustainable food system that respects the ecosystem. However well-motivated, genome editing is a symptom-by-symptom approach where each "tool in the box" is considered in isolation, rather than in the context of the full contents of the toolbox, the workforce and the entire building site on which they are being metaphorically employed.

4.2. Significant claims are made as to the precision and highly targeted nature of genome editing techniques. Indeed, the background information in the call for evidence to this inquiry describes genome editing as "an emerging family of biological techniques for making precise, targeted alterations to living cells." However, precision is not the same thing as accuracy – after all, a stopped clock is highly precise but is only accurate twice a day. Similarly, a targeted intervention, even if accurately applied, will not necessarily have, or be limited to, the intended effect. It is vital that regulation is developed with full awareness of the potential for inaccurate genetic changes and unintended consequences of both planned and accidental changes to the genome.

4.3. The public must be involved in a meaningful way in the development of policy, law and regulation of genome editing in farmed animals. This will require significant work to explore people's concerns and understand the issues they raise, regardless of their ability to employ scientifically accurate vocabulary. It must also encompass consideration of the nature of the problem/s which genome editing is proposed to solve including questions about how the problem has arisen and alternative ways to address it.

4.4. Social and ethical concerns are a vital consideration in the development of public policy, law and regulation of all genetic technologies, not just those which set out to alter the genomes of people or animals. GM Freeze regularly raises social and ethical concerns in our evidence to the statutory consultations which take place before the planting of open field trials of GM crops. As detailed in our evidence to a select committee inquiry into science communication[13] such issues are consistently side-lined as out of scope because the Advisory Committee on Release to the Environment is "only required to consider scientific aspects" of the release.

4.5. The emerging nature of genome editing approaches must be recognised as an inherent concern because it takes time for the risks, benefits and consequences of applying any new technology to be understood. This is a particular issue with the application of genome editing to those farmed animals whose lifespan significantly exceeds that of the animal models used in laboratory trials.

Liz O'Neill – Director of GM Freeze

GM Freeze, c/o Openspace Cooperative, Unit 1, 41 Old Birley Street, Hulme, Manchester M15 5RF
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