

“We must get out more” – Gene editing debate highlights the need for livestock scientists and specifically breeders to talk more openly

Dr Craig Lewis

January 2023

Science for Sustainable Agriculture

The Genetic Technology Bill currently before Parliament could unlock the potentially paradigm shifting impacts of gene editing for farmed animals, and would give livestock agriculture the potential to address major challenges of animal health and welfare, reduce antibiotic use, ease management, and improve sustainability, says livestock breeder Dr Craig Lewis. But as Peers prepare to debate proposed changes to the Bill, he warns that outdated and inaccurate perceptions of modern livestock breeding and production could lead to unwarranted regulatory barriers to these advances. In response, he says livestock farmers, scientists and breeders must redouble their efforts to connect, communicate, and explain the positive contribution of genetic innovation to animal health, welfare and the environment.

When the BBC’s science correspondent, Pallab Ghosh, filed an [article](#) in December 2021 discussing the use of gene editing in animal breeding, it was accompanied by the startling image of a massively obese pig, part of a failed genetic experiment more than 40 years ago.

The BBC article focused on a [report](#) by the Nuffield Council of Bioethics, which characterised modern farming and food production as ‘morally indefensible and unsustainable’, and called for the use of gene editing in farmed animals to be tightly regulated to prevent welfare abuses.

However, like the BBC’s 44-year-old GM pig, Nuffield’s portrayal of modern livestock production was largely out of date and inaccurate and, regrettably, the report overlooked a significant body of evidence presented to the report’s authors by the livestock breeding industry.

The suggestion that Britain’s standards of farm animal health and welfare are poor and deteriorating, and that technologies such as gene editing will make things worse, is simply not supported by the facts, or by what I personally see on farms.

Standards of animal welfare on UK farms are among the highest in the world, and the direction of travel for some time has been, and continues to be, positive and improving. This is not only as a result of better husbandry, nutrition, biosecurity and veterinary care, but also through improved genetics and more balanced breeding programmes - the whole sector really working together to support sustained welfare improvement for animals in our care.

Many of these improvements were documented in a recent [open statement](#) co-ordinated by the All-Party Parliamentary Group on Science and Technology in Agriculture, and signed by leading organisations and individuals across the scientific, breeding, farming, veterinary and input supply sectors.

The open statement strongly supports the inclusion of farmed animals in the Government's Genetic Technology (Precision Breeding) Bill currently making its way through Parliament, suggesting that it would be unethical not to embrace technologies with such enormous potential to improve animal health and welfare.

This includes opportunities for gene editing to provide solutions to devastating and intractable disease issues in the livestock industry, for example through UK-led research to breed resistance to bird flu in poultry, which has caused 7 million captive birds to be culled in Britain since October 2021.

The company I work for today, Genus PIC, in partnership with leading UK research groups such as the Roslin Institute, has used gene editing to deliver pigs with effective resistance to Porcine Reproductive and Respiratory Syndrome (PRRS). PRRS is a devastating condition which impacts both intensive and extensive production systems and is endemic in most pig producing countries worldwide. Traditional breeding and vaccines have failed to stop the spread of the virus, which continues to evolve rapidly, costing the pig industry around \$2.5 billion (£2bn) each year in lost revenue in the US and Europe alone. However, this is less important than the considerable welfare and environmental cost of PRRS which increases pig morbidity and mortality in farms wherever the disease is present. The technology works and we could be making lives better for pigs.

Precision breeding techniques can also help tackle animal welfare issues directly. Only last month, BBC News [reported](#) on game-changing research by Israeli scientists to develop gene edited hens that produce female-only chicks, so avoiding the current practice of culling billions of unwanted male chicks – such a potential breakthrough for animal welfare that campaign group Compassion in World Farming (CIWF) has publicly declared its support for the research.

It is seriously disappointing, therefore, that recent debates in Parliament on the future regulation of new genomic techniques have been typified more by entrenched opposition to animal agriculture per se, and by outdated and/or inaccurate perspectives of livestock breeding and production, than by the positive opportunities to use science and innovation to deliver better outcomes for animals, people, and the planet.

Debates have included provocative references to ‘intensive factory farming’ and ‘further cramming animals together in unsanitary conditions.’ This has nothing to do with precision breeding techniques, which have as much to offer organic or extensive free-range producers, for example, who routinely use the most advanced livestock genetics in their farming systems today, precisely because they offer a better balance of production, sustainability, health, and welfare factors.

My response, as chair of the European Forum of Farm Animal Breeders (EFFAB), which represents and provides a voice for the European livestock breeding sector, is that the onus lies with us, as breeders and scientists, to redouble our outreach efforts, to do more to explain and communicate what we do today and what potentially we can do given new tools. Because we have nothing to hide and a positive story to tell.

As Peers prepare to debate the Precision Breeding Bill at Report Stage, here are seven key reasons to encourage and enable precision breeding innovation in farmed animals, and not to single out these technologies for extra regulation on the grounds of misplaced (and already regulated) welfare concerns.

1. More balanced breeding programmes

Thanks to improvements in genetic science and understanding, enormous progress has been made by farm animal breeders in recent decades to adopt more balanced breeding programmes, taking account of a range of production, sustainability, health and welfare factors. Watch this short [video](#) to find out more. Modern animal breeding even without new technologies has already demonstrated ongoing focus on improvement of production traits but not at the expense of welfare of the animal and aligned to improvement of traits associated with welfare.

2. Responsible breeding

Farmed animal breeders in the UK also adhere to industry codes of best practice such as [CODE-EFABAR](#) to demonstrate their commitment to sustainable breeding. More precise breeding tools such as gene editing represent the next progression in the development of more balanced and responsible breeding programmes, in response to consumer demands for more sustainable, high-welfare and ethical livestock production that the industry wants to deliver. An examination of the pipeline of potential traits for gene editing discussed overwhelmingly focuses on disease resistance and traits associated with on-farm processes that are identified to compromise welfare (eg sexing chicks or dehorning cattle).

3. UK-based research and innovation

Singling out genome editing for greater regulatory scrutiny would inevitably deter investment in research, delay innovation, and ultimately block UK-based development of major health and welfare boosting traits based on our world-leading scientific expertise in animal genetics.

4. Access to improved health and welfare traits

As already described, precision breeding technologies such as gene editing can help accelerate the development of major health and welfare boosting traits such as PRRS resistance in pigs and bird flu resistance in poultry, as well as sexing applications to

avoid the need to cull male chicks. This technology has the potential to supply the single largest farm level step forward in livestock welfare that could impact millions of farmed animals.

5. Existing welfare regulations

The Bill does not seek to replace or change existing farm animal welfare regulations, which will continue to apply to precision-bred animals in the same way as conventionally bred livestock. These regulatory safeguards are in place to maintain high standards of welfare at all stages of production – during early-stage research, breeding, and commercially on-farm – and as such this is not a GE-specific issue. The breeding sector indeed welcomes ongoing, science based, evaluation of welfare regulations to support the ongoing improvement of farm level animal welfare in UK agriculture.

6. UK as a global leader in animal agriculture

Britain has established capacity and strengths in academic and commercial research in livestock genetics. Through a proportionate and enabling approach to regulation, the Precision Breeding Bill presents an opportunity to cement the UK's position as a global leader in productive, sustainable, high welfare farmed animal production.

7. UK response to UN Sustainable Development Goals and net zero commitments

Faced with the challenges of climate change and a predicted doubling of global demand for meat protein by 2050, genetic innovation offers the potential to reduce the climate impact of livestock agriculture – for example by selecting for traits which reduce greenhouse gas emissions – and to improve productivity by reducing waste. In pig breeding, for example, a combined improvement in both productivity and piglet survival rates has seen the sow herd in most European countries decrease by 25% since 2000 while the number of pigs slaughtered has increased by a similar proportion, contributing significantly to food security goals while reducing the overall environmental footprint of pig production.

Subjecting gene editing to greater regulatory scrutiny on the grounds of perceived welfare concerns could actually be counter-productive by deterring or blocking the potential development of major health and welfare boosting traits in farmed animals. We must also consider the socio-economic and ethical consequences and risks of NOT encouraging these techniques, for example in terms of global food and nutrition security, improved prospects for subsistence farmers in developing countries without the infrastructure to routinely access drugs or veterinary care, and the significant potential prevention of future zoonoses and pandemics.

Livestock breeders and scientists recognise our humble duty to provide the raw baseline genetic material into the animal protein chain to provide safe, affordable, enjoyable, sustainable, and ethical food to consumers. However, we also recognise that we need to talk more openly about what modern livestock breeding programmes involve, and how modern breeding objectives are balanced against welfare concerns and indeed are now improving welfare. Ongoing communication and transparency

can only be positive for the future application and acceptance of these and future technologies in agriculture and food production.

As the famous quote says, 'Nobody made a greater mistake than he who did nothing because he could only do a little', and sometimes a small edit makes a big positive difference.

Dr Craig Lewis was raised on a family farm in Herefordshire. He has advanced degrees in Animal Behaviour/Welfare and Animal Breeding/Genetics, including a PhD at the Roslin Institute, University of Edinburgh, after undertaking a research position in Australia. Craig currently oversees Genetic Dissemination for Genus PIC in the Europe/Middle East/Africa region working with pig producers from developing farmers in Africa to multinational integrated food businesses. He is also the current chair of the steering committee for the European Forum for Farm Animal Breeders (EFFAB).