We must consider the ethical implications of not embracing genome editing in farmed animals

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As the bird flu outbreak worsens in the British poultry flock, prompting further housing and biosecurity orders after the virus over-summered in the UK for the first time, it is distressing that animal welfare charities such as the RSPCA are campaigning against the use of genetic technologies, such as genome editing, which offer potential solutions.

And when the Covid pandemic, which has now claimed more than 6 million lives globally, is thought to have originated in animal to human transfer, it is concerning that ethical discussions about the use of genome editing in farmed animals appear to centre more on opposition to livestock agriculture than on the technologies themselves, writes animal geneticist Professor Helen Sang.

There is enormous potential for more precise breeding technologies such as genome editing, in conjunction with our rapidly increasing knowledge of the genes involved in infection and response to disease, to improve the health and welfare of farmed animals.

These technologies enable us to introduce valuable genetic characteristics more precisely than using standard animal breeding genetics, and so accelerate the introduction of important genetic improvements that support sustainable, high-welfare livestock production, while retaining the valuable genetic characteristics of individual breeds.

UK scientists are leading a number of globally significant research projects using these technologies. The main focus of this research is to confer resistance to infectious pathogens, something that is a major challenge using conventional breeding techniques, to provide more effective and sustainable alternatives to prevention with vaccines or treatment with drugs.

The focus of my own research, for example, has been on the potential use of genome editing to develop chickens with resistance to bird flu.

Infection with the avian influenza virus is a major threat to farmed poultry worldwide, with severe strains killing up to 100 per cent of birds in a flock. In rare instances, variants of the virus can infect people and cause serious illness or death.

Researchers at Imperial College London and The Roslin Institute (University of Edinburgh) have successfully used genome editing techniques to stop the virus from spreading in chicken cells grown in the lab. This is a very significant advance which suggests we may be able to use genome editing techniques to develop chickens with genetic resistance to bird flu.

The next stage in the research is to test whether this genetic change can be applied to confer resistance to chickens with no adverse effects on the health of the birds.

We have long known that chickens are a reservoir for flu viruses that not only threaten bird welfare but which might also spark the next pandemic. That is why efforts to control the spread of the disease are so urgently needed.

This year, the bird flu virus has over-summered in the UK for the first time, and outbreaks appear to be increasing in number and intensity as further housing and biosecurity orders are issued. The BBC recently reported that some 48 million birds have been culled across the UK and EU over the past year as a result of the largest outbreak of avian flu on record. Research to identify a route to genetic resistance to bird flu infection could result in protection of chickens, including free range flocks.

This is why, from a scientific perspective, I do not understand the animal welfare organisations campaigning against the use of these genetic technologies. The RSPCA, for example, has described genome editing as 'a serious step back' for animal welfare, claiming there are 'more ethical and humane ways' to solve disease challenges in farmed animals.

The Nuffield Council on Bioethics has also suggested that genome editing in farmed animals raises unique ethical issues, and that its use must therefore be strictly regulated. The Nuffield Council describe modern agriculture and food production as 'morally indefensible and unsustainable', which provides an insight into the basis for their claims, and for the RSPCA's position.

A recent public dialogue exercise, organised as a follow-up to the Nuffield Council on Bioethics' report into genome editing in farmed animals, highlighted the challenge of gauging public attitudes towards one specific technology when there are enormous gaps in people's understanding of how much 'unnatural' science and innovation already goes into the production of our food.

For me, these exchanges highlight the need for a much broader conversation about the role of science and innovation in making our food and farming systems more sustainable in the face of a growing population, a changing climate, and increasing pressure on finite natural resources.

Concerns about livestock farming must not be used to skew the debate around genome editing, which offers enormous potential to improve animal health and welfare, and to prevent future zoonoses (transmission of diseases from animals to humans).

As the world emerges from a global pandemic, amid heightened concerns over food security, and with global demand for meat protein set to double by 2050, I believe it would

be unethical not to embrace the potential of technologies such as gene editing to help improve sustainable, high-welfare production in farmed animals.

When the devastating Covid-19 pandemic struck, we turned to the best available, most advanced molecular technologies to develop effective vaccines in record time, and we celebrated the scientific developments in both public and private sectors that made this possible.

We must apply the same, science-based principles to the use of new genetic technologies to improve prospects for the health and welfare of farmed animals, and to reduce the risk of future pandemics in the human population.

Professor Helen Sang OBE FRSE FRSB has led a research programme at The Roslin Institute (University of Edinburgh) on the development and application of genetic technologies in the chicken. This research included applications in basic biological research, in biotechnology and in the potential of developing genetically disease resistant chickens, with funding from Government (mainly UKRI-BBSRC) and industry. She is a member of the Science for Sustainable Agriculture advisory group.