BBFAW
Business Benchmark on Farm Animal Welfare

INVESTOR BRIEFING NO. 6

SEPTEMBER 2012

Cloning and Genetic Engineering of Farm Animals

ABSTRACT

Cloning and the genetic modification of farm animals are becoming more common in intensive farming systems in many countries. These procedures can have adverse impacts on the welfare of animals involved and their descendents.

Cloning is primarily used to produce identical copies of high yielding and fast growing breeds of animals. The practice is already established in the US, Brazil, Argentina and Japan. Within Europe, however, there has been widespread opposition – on both animal welfare and ethical grounds – to the cloning of animals for food production and to the sale of meat and dairy products from cloned animals and their descendents.

The genetic engineering of farm animals is used in China, the US and Australia to enhance growth rates, increase disease resistance and alter meat and milk composition. The European Commission (EC) is currently considering how to regulate the production and use of GM animals.

Introduction

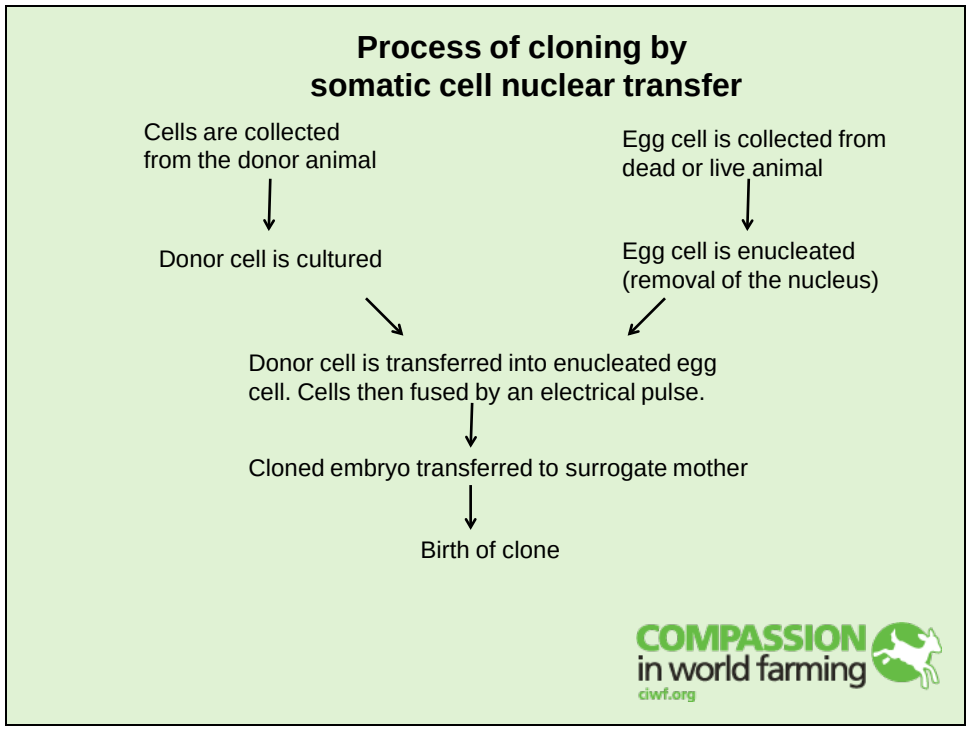
The cloning of farm animals for food production is already under way in a number of countries including the US, Brazil, Argentina and Japan. In the EU, however, cloning has become a controversial issue, with the European Commission (EC) being firmly opposed to the cloning of animals for food production and to the sale of meat and dairy products from clones and their descendants. Interestingly, the opposition of the EC and animal welfare organisations is based on animal welfare and ethical grounds rather than on food safety concerns. While the science currently indicates that food from clones and their descendants does not raise food safety issues, it may be too early to be confident about this.

For many years the use of genetically modified (GM) crops has generated serious concerns and has been rejected by many EU consumers and food businesses. Now the genetic engineering of farm animals is poised to become a major issue in the EU. Genetically engineered farm animals (also referred to as GM or transgenic animals) are being developed outside Europe, and the European Commission is actively considering how to regulate the production and use of GM animals.

Cloning

Overview

The aim of cloning is to produce genetically identical copies of an animal. The procedure involves collecting a cell from the animal that is to be cloned (called the 'donor cell') and transferring it into an egg cell that has been removed from another animal. The donor cell and the egg cell are fused by an electrical pulse and, from this, a cloned embryo is developed. The cloned embryo is implanted into a surrogate (substitute) mother who carries out the pregnancy.



Animal Welfare Implications

Cloning is an invasive process. In pigs and sheep, the transfer of the embryo into the surrogate mother is performed by a surgical procedure. With cattle, embryo transfer is sufficiently stressful for UK law to require a general or epidural anaesthetic.[1]

Scientific Opinions by the European Food Safety Authority (EFSA)[2] show that cloning entails serious health and welfare problems for both cloned animals and their surrogate dams (mothers). EFSA has stated that there is an increase in pregnancy failure in cattle and pigs that are carrying a clone and increased frequencies of

[1] The Bovine Embryo (Collection, Production and Transfer) Regulations 1995: SI1995/2478.
[2] EFSA is responsible not just for food safety but also for producing scientific opinions on animal welfare.

abnormal or difficult births especially in cattle.[3] This, together with the increased size of cloned offspring, makes Caesarean sections more frequent in cattle carrying a clone than with conventional pregnancies.

In its 2008 Opinion on cloning, EFSA concluded: "The health and welfare of a significant proportion of clones ... have been found to be adversely affected, often severely and with a fatal outcome."[4] The majority of cloned foetuses die during pregnancy. In 2012 EFSA stated that only

6-15% of cloned cattle embryos and 6% of cloned pig embryos transferred to a surrogate dam survive to become live offspring.[5] Due to the low efficiency of the cloning process, a high number of animals are used to produce a small number of clones. Of those that survive, a significant proportion dies shortly after birth or during the following weeks from problems such as cardiovascular failure, respiratory difficulties and immune system deficiencies. The EFSA has noted that "the mortality rate of clones is considerably higher than in sexually produced animals".[6]

The Opinion of the European Group on Ethics (EGE) in Science and New Technologies, an independent advisor to the EC, concluded that "considering the current level of suffering and health problems of surrogate dams and animal clones, the EGE has doubts as to whether cloning animals for food supply is ethically justified". The EGE added that it "does not see convincing arguments to justify the production of food from clones and their offspring".

Clones are primarily used as elite breeding animals. It is their offspring that tend to be farmed for meat or milk. The likelihood is that cloning will primarily be used to produce copies of the highest yielding dairy cows and fastest growing pigs. Scientific research shows that traditional genetic selection (also known as selective breeding) has already led to major health problems for such animals. EFSA has concluded that "genetic selection for high milk yield is the major factor causing poor welfare, in particular health problems, in dairy cows"[7] and that genetic selection of pigs for rapid growth has led to leg disorders and cardiovascular malfunction.[8] The use of the offspring of clones on EU farms is likely to entrench the use of animals chosen for extreme yields and growth rates and risks perpetuating the health problems associated with such traits.

[3] EFSA (2008), 'Scientific Opinion on Food Safety, Animal Health and Welfare, and Environmental Impact of Animals Derived from Cloning by Somatic Cell Nuclear Transfer (SCNT) and their Offspring and Products Obtained from those Animals (Question No EFSA-Q-2007-092)', *The EFSA Journal*, 767: 1-49.

[4] *Ibid.*

[5] EFSA (2012), 'Update on the State of Play of Animal Health and Welfare and Environmental Impact of Animals derived from SCNT Cloning and their Offspring, and Food Safety of Products Obtained from those Animals', *The EFSA Journal*, 10(7):2794. [42 pp.] doi:10.2903/j.efsa.2012.2794.

[6] *Ibid*.

[7] EFSA (2009), 'Scientific Opinion of the Panel on Animal Health and Welfare on a Request from European Commission on Welfare of Dairy Cows', *The EFSA Journal,* 1143: 1-38.

[8] Panel on animal Health and Welfare (2007), 'Scientific Opinion of the Panel on Animal Health and Welfare on a Request from the Commission on Animal Health and Welfare in Fattening Pigs in Relation to Housing and Husbandry', *The EFSA Journal*, 564: 1-14.

Some researchers claim that they are managing to reduce the incidence of pathologies and mortalities involved in cloning. However, published evidence suggests that this is not the case. For example, a recent Japanese survey revealed that survival rates of transferred cloned bovine embryos and cloned calves had not improved – and, indeed, had deteriorated - over a decade (1998–2007).[9] In 2012 EFSA updated its Scientific Opinion on cloning and stated that no new information had become available since 2008 that would lead it to reconsider the conclusions in its 2008 Opinion on the animal health and welfare aspects of cloning.[10]

Consumer Reactions

A 2008 Eurobarometer study found that:[11]

- 69% of interviewees agreed that animal cloning would risk treating animals as commodities rather than creatures with feelings;
- 61% of EU citizens thought that animal cloning was morally wrong;
- A majority (58%) of EU citizens were not willing to accept animal cloning for food production;
- 63% of respondents said they were unlikely to buy meat or milk from cloned animals even if a trusted source stated that such products were safe to eat; and
- 83% said that special labelling should be required if food from the offspring of cloned animals becomes available in the shops.

Regulation: The EU Position

The European Commission has voted by a large majority for a ban on the sale of meat and dairy products derived from clones and their descendants, on the cloning of animals for food supply purposes, and the use of clones and their offspring on EU farms.

While, to date, the EU Agriculture Council has not been willing to go so far, it has indicated that it is prepared to:

- Suspend (i) the production of clones, (ii) the use of clones in EU farming, and (iii) the marketing of food from clones.
- Establish traceability systems to enable farmers and businesses to know whether animals are the offspring of clones or whether semen and embryos are derived from clones.

The Council is not, however, willing to prohibit the sale of food from the offspring of clones (though it is prepared to require such food to be labelled) nor to prohibit the use of the offspring of clones in EU farming.

[9] Watanabe S and Nagai T, (2011), 'Survival of Embryos and Calves Derived from Somatic Cell Nuclear Transfer in Cattle: A Nationwide Survey in Japan', *Animal Science Journal* 82**:** 360–365. doi: 10.1111/j.1740-0929.2010.00846.x

[10] EFSA (2012) (Note 5).

[11] Eurobarometer (2008), 'Europeans' Attitudes Towards Animal Cloning'.

The differences between the EU institutions led in 2011 to the breakdown of talks on a proposed new Novel Foods Regulation. The Commission now plans to come forward with proposed legislation on cloning in 2013.

Genetic Engineering

Overview

Farm animals are being genetically engineered in China, the US and Australia for a number of purposes including enhanced growth rates, increased disease resistance and altered meat and milk composition to make them more beneficial for human consumption.

Genetic engineering involves the insertion into an animal of genes from another species or extra genes from the same species. Alternatively it can entail the manipulation or knocking-out of an animal's own genes.

Animal Welfare Implications

A leading French researcher, Louis-Marie Houdebine, has stressed that, "The generation and use of transgenic animals are not neutral as they imply the sacrifice and in some cases the suffering of animals".[12] As with cloning, the collection of egg cells from donor animals and the transfer of GM embryos into surrogate dams may entail poor animal welfare. Also, surrogate dams carrying a GM embryo can experience difficult pregnancies and births and the transgenic animals themselves may suffer from serious health problems.

Animals that have been genetically engineered for faster growth have suffered from a range of harmful side-effects. The production of growth enhanced transgenic animals is most advanced in the case of farmed fish. This has led to serious health and welfare problems in fish including deformities, feeding and breathing difficulties, reduced swimming abilities and reduced tolerance to disease. Interestingly, Scottish salmon farmers are firmly opposed to the use of transgenic salmon, fearing that this will impair the reputation of their product.

Conferring improved disease resistance on animals appears to be benign. However, the European Medicines Agency and the UN Food and Agriculture Organisation have both pointed out that industrial livestock production (where a large number of animals are housed together in close confinement) plays an important part in the emergence and spread of diseases.[13, 14] Arguably the proper

[12] Houdebine L.M. (2009), 'Methods to Generate Transgenic Animals', in Engelhard M., Hagen, K. and Boysen, M. (eds.) (2009), *Genetic Engineering in Livestock: New Applications and Interdisciplinary Perspectives* (*Ethics of Science and Technology Assessment*, 34: 31-48).

[13] Committee for Medicinal Products for Veterinary Use (CVMP) (2006), 'Reflection Paper on the use of Fluoroquinolones in Food-producing Animals in the European Union: Development of Resistance and Impact on Human and Animal Health' (European Medicines Agency).

way to address such diseases is to keep animals in less intensive systems where they will be less susceptible to infection. That is, good hygiene, husbandry and housing rather than genetic engineering should be used to prevent the diseases that stem from factory farming, and transgenic disease resistance should not be used as a way of facilitating the use of industrial systems that fundamentally compromise the welfare of the animals involved. However, disease is also a significant cause of mortality in extensively farmed animals in tropical countries. The legitimacy of using genetic engineering to enhance disease resistance in these circumstances should be considered on a case-by-case basis.

The Public Health Arguments

Biotechnology researchers have pointed to the health benefits of tackling rising levels of obesity and cardiovascular disease in humans by genetically engineering animals to produce lower levels of saturated fats and higher levels of beneficial omega-3 fatty acids. However, the genetic engineering of animals is not the only way that these public health benefits can be achieved. For example, the incidence of obesity and cardiovascular disease can be reduced by improving diets, in particular by increasing the consumption of fruit and vegetables and reducing meat consumption which, in the developed world, has reached excessive levels. A study published in *The Lancet* concluded that a 30% decrease in intake of saturated fats from animal sources in the UK could reduce the total burden from ischemic heart disease by 15%.[15]

Reduced levels of fat, including saturated fat and improved levels of omega-3 fatty acids can be achieved by moving away from factory farmed chicken and grain-fed beef. The fast-growing breeds and cereal-rich diets used in industrial chicken production generally produce meat with more fat and a lower proportion of healthy omega-3 fatty acids than slow-growing strains and free-range chickens whose diet includes legume-based pasture. Similarly beef from grass-fed cattle has less fat and higher levels of omega-3 fatty acids than beef from grain-fed animals. In short, free range chicken and beef have a healthier nutrient composition than factory farmed meat.

Consumer Reaction

Consumers and food companies in the UK and EU have rejected GM crops. They are likely to be equally uncomfortable with GM animals. Consumers may feel that such a high-tech approach to sentient beings is even more disturbing than the genetic manipulation of crops.

---

[14] Otte, J., D. Roland-Holst, R. Pfeiffer Soares-Magalhaes, Rushton, J., Graham, J., and Silbergeld, E. (2007), *Industrial Livestock Production and Global Health Risks* (Food and Agriculture Organization of the United Nations, Pro-Poor Livestock Policy Initiative Research Report).

[15] Friel S., Dangour A.D., Garnett T., Lock K., Chalabi Z., Roberts I., Butler A., Butler C.D. Waage J., McMichael A.J. and Haines A. (2009), 'Health and Climate Change 4: Public Health Benefits of Strategies to Reduce Greenhouse-gas Emissions: Food and Agriculture. Published online November 25, 2009 DOI:10.1016/S0140-6736(09)61753-0

A recent study carried out for the European Commission concluded: "As with GM plants, consumer acceptance is the most important bottleneck for GM animals. Most applications still only benefit the producer offering few incentives for the consumer to accept something that is viewed as unnatural and impacts on animal welfare."[16] The study adds that GM animal products entering the food sector are "expected to generate a strong and negative public response".

Regulation: The EU Position

The EU is funding a project, known as Pegasus, which aims to provide policy support to the European Commission regarding the development, implementation and commercialisation of GM animals.[17] Most of the Pegasus work packages are now available on the Pegasus website. The EU will soon have to make decisions regarding its policy approach to GM animals and food derived from them. There is at present little EU legislation that specifically focuses on the use of GM animals or the sale of food derived from such animals or their offspring. Accordingly, legislation will need to be introduced if the EU wishes to prohibit or restrict the development and use of GM animals and the sale of food derived from them.

Opinion – Compassion in World Farming ('Compassion')

In light of the adverse impact of cloning on the welfare of both the clones and their surrogate dams, cloning has no legitimate part to play in European farming. Cloning would take EU agriculture in the wrong direction. It would perpetuate industrial farming and the use of animals selected for such high yields and growth rates that they are vulnerable to serious health problems. It is out of step with the growing recognition of the need to move towards more sustainable and humane farming.

Cloning is arguably inconsistent with the Treaty on the Functioning of the European Union which recognises animals as sentient beings and requires the EU, in its agriculture policy, to pay full regard to the welfare requirements of animals.

Compassion believes there should be an EU-wide ban on the cloning of animals for food, on the use of clones and their offspring on EU farms and on the sale of meat and milk from clones and their offspring.

The genetic engineering of animals for food production all too often entails suffering for the animals involved. In some cases it seeks to address problems - such as unhealthy human diets and animal disease - that could be tackled just as or more effectively without the use of GM.

For thousands of years people have made use of animals. Genetic engineering, however, represents a major departure in that 'making-use'. It involves

[16] Salat, V.N. and Salter, B. (2011), 'Pegasus Study: Policy implications of Introducing Genetically Modified (GM) Animals in the European Union. Work Package 6, Activity 6.2'.
[17] http://www.pegasus.wur.nl/UK/Project+structure/Work+Packages/

manipulating an animal's genetic structure to make it of more use to us. This approach fails to respect both the animal's welfare and what ethicists refer to as the animal's integrity or its intrinsic worth. We do not need to genetically engineer animals to produce healthier food. We simply need to adopt a healthy, balanced diet.

As with cloning, Compassion believes there should be an EU-wide ban on the genetic engineering of animals for food, on the use of GM animals and their offspring on EU farms and on the sale of meat and milk from GM animals and their offspring.

Author and Contact Details

Educated at Trinity College Cambridge, Peter Stevenson is a qualified lawyer. He is the Chief Policy Advisor of Compassion in World Farming. Peter leads Compassion in World Farming's lobbying at the EU and the OIE. In 2004 Peter was the joint recipient of the RSPCA Lord Erskine Award in recognition of a "very important contribution in the field of animal welfare".

E-mail: Peter.Stevenson@ciwf.org

The **Business Benchmark on Farm Animal Welfare** is designed to help drive higher farm animal welfare standards in the world's leading food businesses. It is the first global measure of animal welfare standards in food companies and is designed for use by investors, companies, NGOs and other interested stakeholders.

For more information, go to www.bbfaw.com or contact the Programme Director, Nicky Amos: nicky@nicky-amos.co.uk.