The Wrongs of Animal Cloning

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The zoologist Jordi Casamitjana looks at the phenomenon of animal cloning and all the ethical problems associated with it

I was working at The Monkey Sanctuary when I heard the news.

It was July, when this primate sanctuary in Looe, Cornwall, UK, was open to visitors, so I just finished the day having given talks to tourists — and feeding the woolly monkeys under our care — when I heard that Dolly had been born.

The news programmes made a big deal of it, possibly because it happened in the UK (in Scotland, to be precise) and it was reported as an event to be proud of. However, I thought that it was not an advancement of science, but another blow to the relationship with other sentient beings that humanity had been demolishing since it began exploiting them about 10,000 years ago. Dolly, you see, was the first mammal who had been cloned from an adult somatic cell (meaning a cell of any part of the body, as opposed to a reproductive cell, such as an egg or a sperm cell). Not the first clone animal, not the first to have been born from artificial fecundation, not the first "lab-grown" or "tube-conceived" mammal, but the first mammal who was genetically identical to another because it had been grown from an adult body cell of the latter, not from normal reproductive processes when mammals come from their mothers' eggs fertilised by their fathers' sperm.

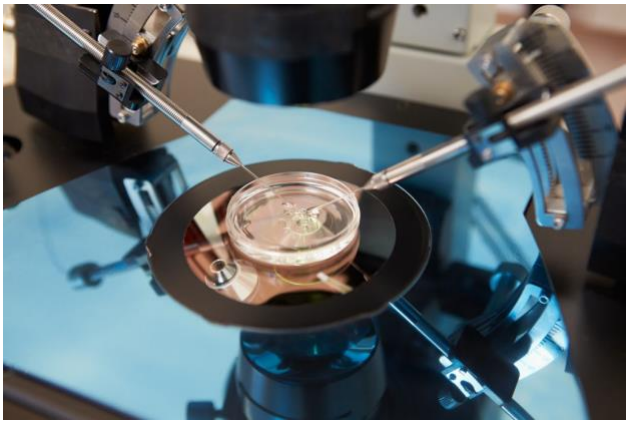
Dolly had another quality that made me feel sorry for her. She was not human; she was a Finn-Dorset female sheep, a type of domestic mammal that has been exploited by humans for centuries for their wool or meat — and now it seemed we should also add "science".

That was in 1996, but that was not the end of the story. That was the beginning. Dolly is no longer a unique mammal to science, as since her birth (and death six years later) many other animal clones have

been born, from many different species (even primates). Most people do not know much about the animal cloning phenomenon, not even ethical vegans like me who often advocate for the rights of all the animals on Earth, but it has already transcended science into the commercial world — and that's not a good thing.

I think that cloned animals have been forgotten, even by animal rights activists, so it is worth looking into this issue and laying out all the wrongs of animal cloning I can see.

What is Animal Cloning?



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Cloning is the process of creating clones, which means identical copies of something (not just a copy, but an identical copy you would not be able to distinguish from the original). There are three different types of biological cloning, where the "original" is a biological entity of some sort (a gene, a cell, a tissue, an organ, or an individual). The most popularly associated with the term cloning is "Reproductive cloning", which is the process that aims to create a genetically identical copy of an entire animal. We also have "Therapeutic cloning" (or cell cloning), which is the process of creating embryonic stem cells that can be used for medical research, as they have the potential to develop into any type of cell in the body, which could be used to treat a variety of diseases. Finally, we have "Gene cloning", which does not involve creating animals at all, but. making copies of specific genes or sections of DNA (this is a very common technique that is used in many areas of biological research). In this article we will be focusing exclusively on the first type, so when we say "animal cloning" we mean "reproductive cloning" of animals.

By the way, natural "clones" kind of already exist, but we call them identical twins, triplets, quadruplets, etc. Also, in nature, some organisms produce clones through asexual reproduction (parthenogenesis). Therefore, there is nothing artificial in being genetically identical to another individual, and some species give birth to twins often, so it is quite normal for them (for instance, marmosets), but we would not call these clones. Instead, we would only call clones those human-made organisms that would not have existed without scientists "creating" them in the labs.

Plants have already been cloned for a long time, but the rarer animal cloning is the artificial creation of animals genetically identical to others, manipulating non-reproductive cells by forcing them to become reproductive gametes, which will become viable embryos that will grow and be born as healthy individuals genetically identical to others that already existed before their development. The most common method to do that is called somatic-cell nuclear transfer (SCNT).

To make a clone following this method, scientists transfer the DNA from an animal's somatic cell into an egg cell that has had its nucleus and DNA removed. The egg develops into an embryo that has grown

from the cell donor (so it would still have the mitochondrial DNA of that cell), but now has all the chromosomal genes of another individual (the DNA of the nucleus has been replaced). Once it has grown a bit, the embryo is implanted into an adult female's uterus to grow (who may not be the same animal as the donor of the DNA, or the donor of the egg). So, a clone animal may have three mothers, the one from whom the clone was born and who should rear the clone into adulthood (if people let her), the one from whom the egg that developed into the clone animal came from, and the one the clone animal is a clone to, as is the one with the exact genes that were injected into the egg.

In the case of Dolly, all this happened for the first time at the Roslin Institute, near Edinburgh. A team led by Dr. Ian Wilmut stole a single cell from the udder of an adult sheep (who nobody seemed to care to give a name worth reporting) and turned it into a viable embryo, which was implanted in a surrogate mother (by force and without consent).

There have been previous attempts before, with mixed success. In one case tadpole cells were used to clone frogs (John Gurdon cloned African clawed frogs in 1958), but this was the first time a viable offspring was grown from an adult animal's cell. The year before the same team cloned sheep embryos by taking an egg from a sheep, removing the nucleus containing its genetic material, then taking a cell from an immature embryo from a different sheep and removing its nucleus, and then using this to replace the nucleus removed from the egg of the first sheep. Out of 250 attempts, two embryos developed into lambs, Morag and Megan, clones of the original embryo.

However, Dolly came from a cell of the body of an adult sheep, not from a cell of an embryo, and this was the breakthrough because it meant you could then clone an individual animal from any cell. Dr Wilmut and colleagues created chemical baths in which adult somatic cells from different tissues can be soaked and their nuclei are turned into a quiescent state, where the division of each nucleus' genetic material is slowed down, making it possible to take it to another cell.

From then on, it was a matter of trying different cells from different animals of different species and seeing if this could be replicated. Several decades later we can confirm that, in many cases, it can.

Who Has Been Cloned So Far?

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Since July 1996, scientists around the world have cloned rats, cows, deers, horses, pigs, wolves, buffalos, rabbits, mouflons, Javan bantengs, camels, coyotes, carps, fruit flies, frogs, goats, black-footed ferrets,

cats, dogs, and even monkeys — there have been even unconfirmed reports that humans have already been secretly cloned in countries where this is not illegal, but the scientific community has rejected such claims. Most of these animals have been forgotten (and those who were the originals even more), but in the spirit of animal rights that focuses on the individuals and not the species, let's remember some of them.

We already talked about Dolly. What happened to her? She spent the rest of her life captive at the Roslin Institute and she became the mother of six lambs fathered by a Welsh Mountain ram. In 2001, at the age of four, she developed arthritis and began to walk stiffly. She was euthanized at the age of six years (she could have lived twice that age) due to a progressive lung disease. A post-mortem examination showed she had a form of lung cancer called ovine pulmonary adenocarcinoma. The Roslin Institute stated that intensive health screening did not reveal any abnormalities in Dolly that could have come from advanced aging, as some suggested that she may have aged faster having been born from the DNA of a cell that was already from an adult individual several years old. Her body ended up being exhibited at the National Museum of Scotland in 2003.

Gene was the first bovid that was a clone of another cow, and he was born in 1997 at the American Breeders Service facilities in Deforest, Wisconsin, US. Unlike Dolly, he was not a clone of an adult, but of a 30-day-old calf fetus of a Holstein bull. He spent her life in captivity, and later he was kept at the Minnesota Zoo Education Center. He was still there in the year 2000, but I don't know when he died. In 2010, a Spanish lab created the first clone of a bullfighting bull. Many more cows and bulls have been cloned since, in countries such as the US, Brazil, Argentina, Turkey, Kanya, and Peru.

The first clone horse was Prometea, born in 2003 in the Laboratory of Reproductive Technology in Cremona, Italy. Researchers fused the nuclei of skin cells taken from one male Arabian thoroughbred horse and one Haflinger mare with eggs taken from slaughtered abattoir horses. Of the 841 successfully reconstructed male and female embryos, just eight male and 14 female embryos developed, and of the 17 embryos inserted into the mares, only four led to pregnancies, being Prometea the only one who survived. It is not known what happened to her in the end, but there have been at least eight more horses successfully cloned since, including Show Me, the first cloned horse to ride onto the Argentine polo pitch.

CopyCat (CC) was the first clone cat created in Texas in 2001 by a team at Texas A&M University. A cell taken from a calico cat named Rainbow was inserted into another cat's embryo, which was then implanted into a surrogate cat named Allie. Even though CC is an exact copy of her host, it has been reported that they had different personalities (CC was shy, while her host was curious). She gave birth to kittens in 2008, and she was still alive in 2011,

In 2005, Snuppy was the first dog to be cloned by scientists at Seoul National University's College of Veterinary Medicine, in South Korea. He was an Afghan hound dog, and a second dog clone died of pneumonia shortly after he was born. Both were created by somatic-cell nuclear transfer. Snuppy was kept captive in the laboratory so scientists could monitor behavioural differences with Tai, his three-year-old genetic donor. In 2015, Sooam Biotech in South Korea was reported to have cloned 700 dogs for their owners (charging $100,000 for each), including two Yakutian Laika hunting dogs. The infamous current president of Argentina Javier Milei is said to keep five English mastiffs who are clones of his now-deceased dog Conan.

The first primate cloned was a rhesus macaque called Tetra. She was born in 1999 in the Oregon National Primate Research Center by a cloning technique called "embryo splitting". In 2000, the same team produced Andi, another rhesus macaque, who was the first genetically modified monkey (he was born with an extra glowing gene called green fluorescent protein). The first successful cloning of primates

using somatic cell nuclear transfer happened in 2017 in China, and the result was a female crab-eating macaque named Zhong Zhong and Hua Hua. In January 2019, scientists in China reported the creation of five identical cloned gene-edited monkeys. Needless to say, all these clone primates were aimed to be exploited by labs in the name of research.

Animal Cloning Is a Type of Animal Abuse?

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Animal cloning causes suffering to the animals involved, and this is one of the most basic reasons why it could be considered animal abuse. Firstly, the donor, host, and surrogate animals are forced into cloning procedures (some of them akin to sexual abuse) which in many cases are invasive and may even involve being killed afterwards. This year, animal rights advocates have been expressing concern over the practice of cloning companion dogs in South Korea, where animal cloning is a legal business but the country has no regulatory framework to monitor it. Shin Joo-woon, an animal rights activist at Korea Animal Rights Advocates, said to The Korean Herald, "*Several other dogs must be sacrificed to satisfy one pet owner's needs. "Donor dogs must go through multiple procedures for the laboratories to retrieve fertilizable eggs and the surrogate mother dogs must be injected with fertilized eggs multiple times until they are successfully implanted into the dogs' wombs. It is difficult to say that pet cloning can be ethical under the current circumstances, as it leaves room for potential exploitation and mistreatment."*

Secondly, the many failed attempts before one clone is successfully born are often forgotten, so for any clone alive many die shortly after birth. Recent studieson cloning using SCNT show that, in cows, only 27% of pregnancies were maintained to term, 87% of calves were liveborn and only 78% survived to weaning age despite intensive neonatal care; in sheeps, 42% of pregnancies were maintained to term, 100% were liveborn, but only 50% survived to weaning; in pigs, there is a high level of embryo mortality and when pregnancy is established only 65% of sows hold to term, 84% of piglets were liveborn and 75% of liveborn survived to weaning.

Also, many of the embryos created through cloning are not viable (fewer than 5% of cloned embryos usually survive to birth), but although many would have perished before they would be sentient, some may do so just before birth after they have been in development long enough to become sentient.

Thirdly, although this tends to be underreported, many of the surviving clones suffer from health problems throughout their lives. In the first study to review the long-term health outcomes of cloning, produced in 2016, the authors said that they found no evidence of late-onset, non-communicable diseases, other than some minor examples of osteoarthritis. However, those who tried to make animal cloning a business discovered that this is not entirely true. Lou Hawthorne was the head of the pet cloning company BioArts which decided to close down due to problems discovered in the clone animals they produced. In 2009, he wrote on the company's website the following when explaining why they stopped: "*After*

studying this market for more than a decade — and offering both cat and dog cloning services — we now believe the market is actually extremely small…One clone — which was supposed to be black and white — was born greenish-yellow where it should have been white… Others have had skeletal malformations, generally not crippling though sometimes serious and always worrisome… These problems are all the more worrisome given that cloning is supposedly a mature technology in general."

In 1999, a study by French scientists suggested that cloning may cause long-term health defects after a two-month-old calf cloned from genes taken from the ear of an adult cow died after developing blood and heart problems. They believed that the cloning process interfered with the normal genetic functioning of the developing calf.

Some hypotheses explain why clones might have worse health outcomes than non-clones, especially premature aging, and problems with the immune system. One is based on incorrect epigenetic reprogramming of the donor genome. Another could be related to the DNA from an adult cell having more uncorrected mutations as it has lived longer, and time increases the chances of deleterious mutations occurring — and the biochemical mechanisms to correct them failing. In normal reproduction, the new genetic combination of genes of each newborn has only existed since fecundation (when the genes of the mother and the father combined uniquely), so if the organism is healthy all the genes responsible for that good health have not much time to mutate from environmental factors.

However, the DNA of the cells of an adult animal had that time, so it is possible that when introduced into the host egg that will grow to be the clone, that DNA already had too many key mutations and may lead to a less healthy individual — from a genetic point of view.

One genetic phenomenon that is related to ageing is the reduction of telomeres (sections of DNA at the ends of chromosomes that seem to reduce in size the more the cell divides itself) — which, incidentally, a recent study in identical twinsshowed that those in a plant-based diet have bigger telomeres — so it is possible that SCNT clones may develop differently (ageing sooner) because the DNA of the somatic cell came from chromosomes with shorter telomeres ("aged" chromosomes). This suggests that producing clones from other clones would make the problem worse (putting into question the feasibility of replacing entire herds of farmed animals with clones of the most "productive" ones).

The UK animal welfare organisation RSPCA has this to say about animal cloning: "*Cloning is a serious concern for the RSPCA. The process involves scientific procedures that can cause pain, suffering and distress, with little consideration for ethics or animal welfare. What's more, cloning never creates a true copy of the original animal. All animals are individuals, with their own personalities.*"

Compassion in World Farming has this to say about it, "*The cloning of farm animals can involve great suffering. A cloned embryo has to be implanted into a surrogate mother who carries it to birth. Cloned embryos tend to be large and can result in painful births that are often carried out by Caesarean section. Many clones die during pregnancy or birth. Of those that survive, a significant proportion die in the early days and weeks of life from problems such as heart, liver and kidney failure.*"

Cloning As a Modern Form of Domestication

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Health deterioration after artificial genetic manipulation is not a new phenomenon. It is an intrinsic part of the breeding of domestic animals, which, after all, are genetic aberrations created by humans as in the cases of clones, but rather than in a lab with SCNT, in a farm through artificial selection and insemination.

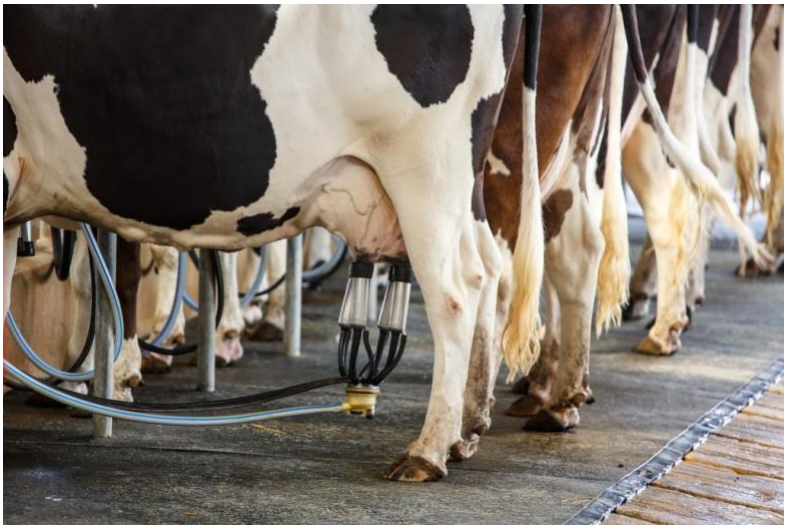
Humans have been genetically manipulating animals for over 10,000 years by keeping them captive and selecting with whom should they breed in order to develop traits that humans want (such as bigger size, tameness, higher egg production, particular colours, etc). The result of this artificial selection process is called domestication, and several species of animals exist today from this process (such as domestic cows, pigs, goats, dogs, or horses). This has been genetic engineering by farmers rather than lab scientists, but in the last 75 years or so both have joined forces to produce more and more genetic aberrations that would increase their profits.

However, the more domesticated the animals are (meaning their genes are more different than those of their wild counterparts) the more health and mental problems they carry, but this is considered "a price worth paying" because as long as those breeding them can still exploit them for profit, whether they are fit or will live long lives does not really matter to them. Domestic animals bred for food or fibre are killed when they are very young, so it does not matter if the genetic combinations humans created cause many long-term health issues if they still make the animals grow faster and produce a lot of flesh, milk, skin or hair.

Companion animals bred as pets are the same. Dogs of particular breeds suffer many health problems associated with their breed as they are wolves forced to live in very deformed bodies, but those who "buy" them do not care and accept that dying in just a few years and being unable to run or even breathe properly is a price worth to pay to be able to enjoy their "cuteness". Imagine how selfish a person could be that, instead of rescuing a dog from a shelter, pays for a dog who suffered and died due to his or her unnatural defective "pedigree" genes to be forced to be born again and suffer the same fate.

Manipulating animals genetically is wrong and the products of such manipulations are genetic aberrations that often suffer because of the unnatural gene combinations they have been forced to have. Whether this manipulation has been achieved in a lab, a farm, or a puppy mill, it's still wrong because it causes the same types of congenital problems and perpetuates the idea that sentient beings can be property humans can manufacture and patent.

What Else is Wrong with Animal Cloning?



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Another reason animal cloning is wrong is because it is done by animal exploiters to be able to exploit more animals, with little regard for their wellbeing. Animal cloning is not only a form of animal exploitation in itself but is also a tool for animal exploiters to maximise their exploitation of non-human animals. We, vegans, consider any form of animal exploitation to be wrong, so for us, there is no doubt animal cloning is wrong.

Here is an example of how the dairy industry is using cloning to catapult their exploitation of cows to another level. Through artificial selection, cows have been genetically modified generation after generation to force them to produce much more milk (at their welfare expense), but not all the cows produce the same amount, or the offspring of those who produce lots produce the same amount than their mothers (as their genes are not identical since they have the father's genes mixed up in their cells too). So, dairy farmers now want to clone the cows that produce more milk (called super-cows), to increase their herd production.

Chinese scientists have estimated that only five cows in 10,000 can produce 100 tonnes of milk during their lifetime, so they wanted to clone those. In April 2023, Chinese state media reported that a group of Chinese scientists had successfully cloned 3 super-cows. Jin Yaping is one of these scientists who told the Global Times that the birth of super-cows was a breakthrough allowing China to preserve the very best cows in an economically feasible way. If they scale this cow cloning up, other countries will imitate them, and this means that the dairy industry may survive the current crisis a bit longer caused in part by the plant-based milk disruption if they can now manage to produce more milk at less cost.

The same goes with the cloning of primates and rats in labs, which is done to be able to do more vivisection, not less (against the famous three R's policies of Reduction, Refinement and Replacement that many governments falsely claim they implement). Animal cloning is just another tool developed by animal exploiters for animal exploiters, to be able to exploit more animals and perpetuate their practices.

There is a pattern we can detect in all the animal cloning cases we have discussed. Despite giving them names, most of these animals were treated as research objects or "creations" born in a world of exploitation (vivisection, farming, sport, etc.) where they would never be real animals living normal free lives. Many of them ended up being treated as freaks to be paraded even after death, and little has been

published about how the lives of most ended. Their names were, actually, scientific trophies, not marks of identity, because vivisectionists do not name the "objects" of their research, only the trophies they can boast about in press releases when they have achieved a "first" in their fields.

In a world where non-human animals are treated as commodities, property, subjects of research or trophies to exhibit, those literally "created" in a lab will be treated even more this way. They reinforce the speciesist notion that they don't matter, and at the most, their lives are secondary to ours. Animal cloning by humans creating animals for exploitation in a lab reinforces the sense of human supremacy that vegans are fighting against, and this is why it is wrong on a very fundamental level.

Even the journalist of the Guardian who was reporting about the birth of Dolly 27 years ago knew that not all was good news. Robin McKie wrote, *"Scientists have created the first clone of an adult animal. They have taken a cell from a sheep's udder and turned it into a lamb. The development is a landmark in biological research – and a triumph for UK science, one that should lead to breakthroughs in work on ageing, genetics and medicines. But cloning is also likely to cause alarm. The technique could be used on humans, drawing parallels with Huxley's Brave New World and the film The Boys from Brazil, in which clones of Hitler are made."*

This alarm implies that the fear of taking humans into the cloning route is a fear that they would end up being unfairly manipulated or dehumanised, which is precisely how non-human animal clones are treated. This is another example of speciesism, whereby people's concerns about some practices done to non-human animals are not coming from caring about such animals, but from fear that humans may end up being the victims of the same practices if they are perfectioned and popularised.

If people are afraid of human clones, and how rich and powerful humans can abuse this technology, is not going to help if they allow the technology to be developed through the animal kingdom until it is routinely done in primates. It may be too late if they try to stop it at the ape level. They should have tried to stop it when it was done to sheeps in 1996 and the alarm was first raised, and when it was done to the other unfortunate victims ever after. It may be too late now.

We are already living in the era of animal cloning, and it seems it is going to get worse for everyone. Not only humans who may become the victims but all the many more non-human animals who will be exploited with this technology, and suffer a worse quality of life than the rest of the exploited animals who are already suffering from such exploitation.

All animals, wild or domestic, captive or feral, clones or original, deserve a fulfilled life free from exploitation, and those like me who advocate for animal rights will never accept animal cloning as a progress of civilisation.

We should not forget the cloned animals.