



Buyers Beware:

**Pet Cloning
is NOT for
Pet Lovers**

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Executive Summary

The cloning of cats and dogs, particularly for pets, has drawn global media attention, but the serious animal suffering and disreputable activities that can go on behind the scenes of the cloning industry have largely been overlooked. A newly released report by the American Anti-Vivisection Society (AAVS) and The Humane Society of the United States (HSUS) investigates and exposes an industry fraught with questionable science and consumer deception, drawing much-needed attention to the animals and people who are being exploited for profit.

The report, “Buyers Beware: Pet Cloning is Not for Pet Lovers,” highlights several major problems with the pet cloning industry.

Animal welfare: The cloning process, still experimental, subjects hundreds of dogs and cats to painful and invasive procedures and produces abnormal animals who typically fail to survive birth. This hidden toll on animal life is rarely mentioned by cloning companies when advertising their services. According to published reports of cloning studies, however, a total of 3,656 cloned embryos, more than 319 egg “donors,” and 214 surrogate mothers have been used to produce just five cloned dogs and 11 cloned cats who were able to survive 30 days past birth. (Appendices A and B of the report further detail the animal welfare concerns associated with pet cloning.)

Deception: There are cloning companies try to capitalize on people’s grief over losing a companion animal, charging exorbitant fees for gene banking and cloning as ways to “resurrect” their beloved pets. However, these companies offer no proof that pet cloning is viable or that a cloned animal will resemble the original animal either physically or behaviorally. In South Korea, the latest hotspot of cloning activity, cloning researchers there have been prosecuted by their government for fraudulent activities and suspended from research.

Public disapproval: According to several national surveys, an overwhelming 80 percent of Americans believe it is unacceptable to clone dogs, cats, and other companion animals. There are companies that prey on people’s attachment to their companion animals to create demand for pet cloning, but the public does not support it.

Regulatory oversight: In the US, the pet cloning industry is not regulated like other research facilities that conduct experiments on animals. U.S. researchers and companies who clone cats and dogs for pets should be following the minimum standards of humane treatment and care for animals as outlined in the Animal Welfare Act, but the U.S. Department of Agriculture does not require them to do so. In South Korea, it is unclear how the pet cloning industry is regulated, if at all. If cloning experiments are performed in a university lab, researchers must abide by the university’s laboratory guidelines, which have no force of law. In addition, it is not possible to know how many cats and dogs are used and what happens to them during cloning experiments, except for what little gets reported in the scientific literature.

The report also chronicles the activities of the few companies and universities that have tried to make a business of cloning cats and dogs. The technology is experimental and frequently fails, but these companies tend to exaggerate its potential while exploiting cats and dogs and devoted pet lovers.

Genetic Savings & Clone, Inc.: Genetic Savings & Clone, Inc. (GSC) was started in 1999 by John Sperling, a billionaire who wanted to clone his dog, Missy. GSC charged clients \$295-\$1,395 for gene banking and \$50,000 to clone a cat, even though the only cat the company had cloned so far, CC, has a different physical appearance and personality from her genetic ‘donor.’ In 2004, GSC offered to accept six ‘orders’ for cloned cats, but was able to obtain only five, and delivered only two. One, Little Nicky, was never confirmed through DNA testing to be a clone and it has been reported that he looks and behaves differently than the genetic donor. GSC failed to ever clone a dog, though it did have a “National Breeders Network” through which dog breeders could ship dogs, who they otherwise could not sell, to the company's lab and rent them out as surrogates to give birth to cloned puppies.

AAVS launched its No Pet Cloning campaign in 2004 to educate the public about the animal welfare and consumer fraud problems associated with pet cloning, and in 2006, GSC closed its doors because it could not turn pet cloning into a viable business.

Seoul National University: Researchers at Seoul National University (SNU) have become the main players in pet cloning experiments, even though they originally justified their work as having applications to veterinary medicine, human biomedical research, and/or the conservation of rare animals. In 2005, Woo-Suk Hwang and Byeong Chung Lee led the team that produced the first cloned dog, an Afghan hound named Snuppy. It was later revealed that Hwang had committed fraud related to his human embryonic cloning research and Lee was suspended from his job for his role in the scandal. DNA analysis did reveal that Snuppy was a genetic clone, however. Lee has continued his cloning research, producing two wolves in another study that was investigated for validity, and conducting several dog cloning experiments that provide further evidence of the failures and abnormalities caused by cloning. In 2008, Hwang announced that he was seeking foreign investment for a new pet cloning business.

Sunchon National University: Researchers at Sunchon National University have conducted several experiments on cat cloning. As with other cloning studies, the researchers found that cloned cats were not identical to their genetic ‘donors,’ and very few cloned cats were born successfully.

RNL Bio, Co., Ltd.: In January 2008, RNL Bio, Co., Ltd. (RNL Bio) announced a partnership with SNU's Veterinary Medical Teaching Hospital to open a new center to commercialize animal cloning. In February 2008, RNL Bio announced that it had received its first order, agreeing to clone a deceased pit bull dog named Booger for a California resident for \$150,000. Despite admitting that the cloned dog would not act exactly like Booger, the company promoted its services as being able to provide people with “the same dog for their whole lives.” The company's pet cloning activities are reportedly on hold due to a patent dispute.

Start Licensing: Start Licensing is a joint venture between U.S.-based Geron Corporation and Exeter Life Sciences, Inc. (a holding company of John Sperling). It has claimed that it controls Korean patents on animal cloning techniques, and SNU and RNL Bio are not licensed under them. It has threatened to take legal action, but has not yet done so. In May 2008, however, Start Licensing granted exclusive On May 21, 2008, Start Licensing granted a sole license with exclusive rights to clone dogs and cats to BioArts International, Ltd.

BioArts International, Ltd.: When GSC closed, it was reorganized under the BioArts International, Ltd. title. In May 2008, BioArts announced that, in conjunction with disgraced scientist Woo-Suk Hwang and the Sooam Biotech Research Foundation in South Korea, it had cloned three dogs using Missy's DNA. For BioArts' "Best Friends Again" project, Lou Hawthorne says it plans to offer dog cloning to the public through an online auction with bids starting at \$100,000. In doing so, Hawthorne and Hwang are again misleading people into believing that cloning will bring back a lost pet and are hiding the animal suffering involved in chasing such false hopes.

As the investigation by AAVS and the HSUS shows, dog and cat cloning is fraught with animal suffering and false promises. Numerous cats and dogs are subjected to terrible suffering, with more than 99 percent of cloning attempts failing, even though a cloned animal is unlikely to resemble the original animal. There is no replacing a beloved companion, yet a few people nonetheless continue to engage in these disreputable activities to try to take advantage of grieving owners and turn a profit. Buyers should beware and the public should continue to steer clear of this bizarre and inappropriate use of science.

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***The American Anti-Vivisection Society** is the oldest animal advocacy and educational organization in the United States dedicated to ending experiments on animals in research, testing, and education. Founded in Philadelphia in 1883, AAVS pursues its objectives through legal and effective advocacy, education, and support of the development of non-animal alternative methods. — On the web at www.aavs.org and www.NoPetCloning.org.*

***The Humane Society of the United States** is the nation's largest animal protection organization — backed by 10.5 million Americans, or one of every 30. For more than a half-century, The HSUS has been fighting for the protection of all animals through advocacy, education and hands-on programs. Celebrating animals and confronting cruelty — On the web at humanesociety.org.*

BUYERS BEWARE: PET CLONING IS NOT FOR PET LOVERS

The cloning of cats and dogs, particularly for commercial sale, has drawn global media attention, but the serious animal suffering and disreputable activities that go on behind the scenes have been largely overlooked. This report investigates and exposes a business endeavor fraught with questionable science and consumer deception, drawing much-needed attention to the animals and people who have been exploited for profit.

As with the cloning of other animals, dog and cat cloning is often not successful, resulting in tremendously high failure rates. Hundreds of animals are used in invasive and painful procedures to produce just one cloned animal.* Few cloned animals are born alive, and many of those who do survive birth suffer health problems and die soon thereafter. (See Appendix A for details of published studies on cat and dog cloning, and Appendix B for a summary of the numerous animal welfare concerns associated with pet cloning.)

Despite the suffering that is involved in cloning animals, there are companies that prey on individuals' emotions and family attachments to companion animals by commercializing gene banking and promoting pet cloning. These companies have charged steep fees for their services, yet have had no demonstrated ability to fulfill what few orders they have received.

Dog and cat cloning companies are also trying to capitalize on claims of 're-creating' deceased pets, even though there is no proof that cloned animals will physically or behaviorally resemble the original animals from whom they were cloned.

South Korea now appears to be the latest hub for cat and dog cloning, with several papers discussing cloning milestones published by university researchers there. However, their activities continue to be on the fringe of what the public deems acceptable. Surveys have shown that an overwhelming 80 percent of Americans disapprove of cloning pets, and there is no replacing a beloved companion.

In the US, pet cloning laboratories are not regulated like other research facilities that conduct experiments on animals. U.S. researchers and companies who clone cats and

* Attempting to clone an animal begins with performing a biopsy on a live or very recently deceased animal to collect DNA from the cells. The tissues are cultured (grown), and the cells are preserved. Also, oocytes (eggs) are surgically removed from females of the same species and their nuclei (genetic material) are removed. The eggs and cells then are fused together. The resulting cloned embryos are surgically implanted—several at a time—into each female surrogate animal, who has been pumped with hormones to artificially -induce a reproductive cycle. Most surrogate animals do not develop pregnancies or carry them to term. Cloned animals who survive birth will carry genetic traits of both the animal from whose DNA they were cloned and the animal whose egg was used.

dogs for pets should be following the minimum standards of humane treatment and care for animals as outlined in the Animal Welfare Act, but the U.S. Department of Agriculture does not require them to do so. In South Korea, it is unclear how pet cloning is regulated, if at all. If cloning experiments are performed in a university lab, researchers must abide by the university's laboratory guidelines, but these do not carry the force of law. In addition, it is not possible to know how many cats and dogs are used and what happens to them during cloning experiments, except for what little gets reported in the scientific literature.

Though very little is known publicly about those involved in pet cloning, this report relies on published scientific studies, company promotional materials, and news media articles to chronicle the activities of the universities that have researched and companies that have tried to create demand for commercially produced cloned cats and dogs.

What emerges is a picture of people who could take advantage of cats, dogs, and devoted pet lovers by making false promises and using faulty technology if buyers do not continue to beware and the public does not continue to reject this bizarre and inappropriate use of science.

GENETIC SAVINGS & CLONE, INC.

Inspired by the cloning of Dolly the sheep, University of Phoenix founder and billionaire John Sperling sought to clone his dog, Missy, an aging husky-border collie mix.¹ Sperling, who also owns and invests in companies that fund research into extending the lives of humans and developing animal and human biotechnology (including livestock cloning), put Lou Hawthorne, a documentary filmmaker, in charge of what was called the "Missypticity Project." In 2000, the project, funded through Sperling's BioArts and Research Corporation and Genetic Savings & Clone, Inc. (GSC), provided millions of dollars for dog and cat cloning experiments led by Dr. Mark Westhusin at Texas A&M University (TAMU). Even before demonstrating an ability to produce cloned pets, GSC began promoting pet cloning to the public and charging clients to bank their cats' and dogs' DNA with a promise that GSC could one day clone them.²

CC

"Operation CopyCat," a related project led by Westhusin, was also funded under the Missypticity Project at TAMU, and it resulted in the birth of the world's first cloned cat named CC (short for 'carbon copy' or 'copy cat') on December 22, 2001.³ In order for CC to be born, a total of 87 cloned embryos were surgically implanted into eight surrogate cats. The result was one miscarriage and the live birth of CC via Caesarean section (a method commonly used in animal cloning). Although CC was cloned through the use of cells obtained from a calico cat, she is gray and white.

Sperling invested an estimated \$3.7 million in cloning experiments at TAMU,⁴ and according to GSC's website, over 245 dogs and cats were used.⁵ However, in 2002,

GSC withdrew its funding from TAMU following disagreements over scientific procedures and priorities.*⁶

In 2006, TAMU reported that CC had given birth to three kittens.⁷ Though not independently verified, as of April 2008, a TAMU spokesperson reported that CC and her offspring are reportedly doing “very well.”⁸

“Nine Lives Extravaganza”

Following its split with TAMU, GSC established its own private laboratory in Texas. In 2004, GSC began advertising a “Nine Lives Extravaganza” in which it offered to clone six cats for sale to the public and three cats for its own use in exhibition.⁹ The marketing campaign included a direct mail effort, which was discovered when a post card landed in the home mailbox of Paul Koretz, a California State assemblyman who had co-sponsored state legislation to ban the sale of cloned pets. The company reported that five orders were taken from the public and promised to fulfill them by November 2004. In October 2004, Lou Hawthorne stated that GSC had “several pregnancies in progress,”¹⁰ yet only two cats were ever delivered to paying clients. GSC also claimed to successfully clone three cats, Tabouli, Baba Ganoush, and Peaches for sales exhibition purposes.^{11 12}

Little Nicky

In December 2004, GSC announced its first sale of a cloned cat, Little Nicky, for \$50,000 to a customer named Julie in Texas.¹³ The kitten was cloned using DNA from Nicky, a 17 year-old Maine coon cat.¹⁴

Although the media coverage revealed that the kitten initially charmed Julie during her introduction to him, it has been reported that this client actually doubts that her cat was cloned and has never received results of DNA testing from GSC proving Little Nicky to be a clone.¹⁵ She also reports that, as an adult, Little Nicky looks and behaves differently than her original cat.

Little Gizmo

Only one other cat is known to have been sold by GSC: a kitten named Little Gizmo, who was cloned from Gizmo, 13 year-old mixed Siamese cat. Little Gizmo was delivered on Valentine’s Day (February 14) 2005 to a man named Dan in Southern California.¹⁶ That same day, in honor of its fifth anniversary, GSC dropped its price for a cloned cat to \$32,000.

* For instance, the cloning of CC, whose physical appearance and personality is quite different from her genetic ‘donor,’ presented a serious public relations problem for GSC. GSC staff had requested that a Himalayan cat be used to obtain DNA, but CC resulted from the use of DNA taken from Rainbow, a calico cat from the TAMU laboratory.

Furthermore, CC was cloned through the use of cumulus cells (i.e., cells that surround a female’s developing eggs) from Rainbow’s ovarian tissue, but GSC wanted to demonstrate that cloning could be done using tissue samples taken from other sites of the body since many animals of potential clients are spayed or are male. TAMU researchers had originally used cells obtained from the oral mucosa of a male cat to produce cloned embryos; however, only one of the embryos resulted in a pregnancy, which failed.

DNA Banking

GSC reportedly attracted around 1,000 clients¹⁷ who paid various sums of money (\$295-\$1,395, depending upon the animal's health status or death) to bank their cat or dog's DNA.¹⁸ In mid 2005, GSC opened a lab in Waunakee, Wisconsin, where it planned to intensify efforts to clone a dog. In its public newsletter, GSC also announced a "National Breeders Network" through which dog breeders could ship females in heat and rent them out to act as 'surrogates' to give birth to cloned puppies.¹⁹ GSC also began offering kittens and surrogate mother cats for adoption to the public via its website. It is not known how the kittens and cats were used or obtained and whether or not they were adopted.

GSC Closes

GSC was reorganized under the BioArts International title, which also included offshoot projects related to gene banking/matching of purebred cats (to match with others in their breed) and equine cloning. By October 2006, GSC had not cloned Missy, or any other dog, and the company closed because it was "unable to develop the technology to the point that cloning pets is commercially viable."²⁰

AAVS's No Pet Cloning Campaign was successful in educating the public about the animal suffering and deception involved with cat cloning. As a result, there was no demand for cloned cats.

When GSC closed, it referred clients to Viagen (another cloning company also owned by John Sperling) and transferred banked DNA samples to other labs, but noted that Viagen had no plans to offer cat or dog cloning services.²¹ GSC's labs were taken over by Viagen. Sperling had invested approximately \$14 million in GSC.²²

Best Friends Again

In May 2008, BioArts announced that, in conjunction with disgraced scientist Woo-Suk Hwang [read more about Hwang below in "Dog Cloning Research in South Korea"] and the Sooam Biotech Research Foundation in South Korea, it had cloned three dogs using Missy's DNA.²³ For BioArts' "Best Friends Again" project, Lou Hawthorne says it plans to offer dog cloning to the public through an online auction with bids starting at \$100,000. Hawthorne and Hwang are leading people to believe that cloning will bring back a lost pet and are hiding the animal suffering involved in chasing such false hopes.

OTHER US PET CLONING EFFORTS

While GSC was the most well-known company to promote pet cloning, other companies also tried to capitalize on people's attachment to their companion animals: Lazon Biotechnologies, ForeverPet—both of which are now defunct—and PerPETuate. PetPETuate was founded in 1998 and is affiliated with Cyagra, a company that promotes livestock cloning and genetic banking. PerPETuate advertises gene banking for pet cloning on its website for \$1,200 (with a fee of \$100 each year thereafter for storage).

However, its web site states, “No one knows for certain when, or if, pet cloning will be commercially possible.”²⁴

DOG CLONING RESEARCH IN SOUTH KOREA

Seoul National University

As mentioned, South Korea has become the center for pet cloning experiments. Researchers at the Seoul National University (SNU) College of Veterinary Medicine in Seoul, South Korea have conducted several dog cloning experiments, which are funded by the Korean Ministry of the Environment graduate fellowships and the Korean Science and Engineering Foundation (KOSEF).^{25 26 27} Their work was initially justified as potentially applicable to veterinary medicine, human biomedical research, and/or conservation of rare animals, but over time they began to include pet cloning as a motive.

Snuppy

In August 2005, a brief paper describing the first successful birth of a cloned dog, an Afghan hound named Snuppy, at SNU was published in *Nature*.²⁸ It describes the results of the surgical implantation of 5-12 cloned embryos (created using cells grown from an ear tissue biopsy of a male Afghan hound) into each of 123 female dogs. [The paper did not specify the number of dogs used to surgically obtain oocytes (eggs) for embryo production.] Of the 1,095 implanted embryos, three developed into pregnancies. One resulted in a miscarriage, and two others developed full-term and were born via Caesarean section: Snuppy, and another puppy who suffered from neonatal respiratory distress and died of aspiration pneumonia after 22 days.

According to the paper, procedures used for the cloning of Snuppy could be used for therapeutic cloning (to produce embryonic stem cells) or to help to preserve rare animals. Gerald Schatten, a co-author on the Snuppy paper sought to distance the research team from commercial pet cloning by stating to the media that “Neither (the) results, nor we, support pet cloning.”²⁹ He also said, “This is to advance stem cell science and medicine, not to make dogs by this unnatural method.”³⁰

In 2005, Woo-Suk Hwang, the lead researcher on the Snuppy project, was accused of committing fraud related to human embryonic cloning research.³¹ SNU announced that Woo-Suk Hwang’s work on cloned human embryos and stem cells lines, which had been widely published in the scientific literature, was based on fraudulent data and that he had used the eggs of female employees. Hwang was charged by the Seoul Central District prosecutor’s office with embezzlement (US \$3 million), fraud (fabrication of data to obtain funding), and violation of a bioethics law that prohibits researchers from purchasing human eggs.³² DNA analysis, however, did indicate that Snuppy is a genetic clone.³³

In May 2008, there were press reports that Woo-Suk Hwang is working to establish a Seoul-based pet cloning company that will also involve research into producing human organs for transplants and more work on cloning human embryonic stem cells.³⁴

Bona, Peace, and Hope

In March 2007, another dog cloning paper was published³⁵ by several members of the SNU Snuppy cloning research team now led by Byeong Chung Lee, who was suspended from his university job for three months for his role in the stem cell scandal and misappropriation of research funds.³⁶ The paper describes the cloning of three female Afghan hound puppies.³⁷ Researchers used cells obtained from a two month-old female Afghan hound named Jessica to produce the cloned embryos; an average of 13.9 cloned embryos (produced using eggs surgically removed from 23 dogs) were surgically implanted into 12 dogs. Three dogs were diagnosed as pregnant, carried to term, and as with Snuppy, one live puppy from each was removed via Caesarean section after 60 days of gestation. The puppies were named Bona, Peace, and Hope. The goal of the experiment was to have cloned female dogs with whom Snuppy could be mated. It has been reported that Bona and Hope were successfully impregnated by Snuppy (through artificial insemination) and are expected to give birth in mid-May 2008.³⁸ If successful, the puppies will be touted as the first cloned offspring (or second generation) of cloned dogs.

Other South Korea cloning efforts

An April 2007 paper co-authored by Lee, Hwang and others describes the cloning and live births of two wolves at SNU.³⁹ After the paper was published, the authors requested that corrections be made to the data presented in the paper.⁴⁰ In addition, the editor of *Cloning and Stem Cells*, the journal in which it was published, requested that the SNU Committee on Research Integrity investigate the validity of the research. The full paper was removed from the journal's website and only the one-page correction can be accessed. Though the committee confirmed that the wolves are genetic clones, it criticized the research team for its statistical errors. Lee, who was the head of the research team, was reportedly banned from conducting research for scientific publication, receiving research funding, and publishing research for six months.

A January 2008 paper also published by Lee and researchers at SNU briefly describes several experiments aimed at improving the production and development of cloned canine embryos.⁴¹ In addition to perceived applications in agriculture and biomedical research, the researchers state that pet cloning is another stimulus. One experiment describes the use of bovine eggs to produce cloned canine embryos. Another experiment involved the implantation of approximately four cloned embryos into each of eight dogs, none of whom developed pregnancies.

Toy Poodle

The cloning of a toy poodle by Lee and other SNU researchers is described in a paper published in March 2008.⁴² In this case, the researchers justify their work by indicating applications to cloning of service animals and "replacements for highly valued pets." One goal of the experiment was to demonstrate whether or not a small dog could be cloned

using cells obtained from an aged dog—in this case a female 14 year-old toy poodle—and using eggs taken from and then carried by large breed dogs. A second goal was to evaluate the origin of the cloned animal's mitochondrial DNA (mtDNA) and telomere length (sequences at the end of chromosomes). There is concern that the cloning of older animals results in shorter telomere length in the cloned animals, which may result in a shortened lifespan, based on the case of Dolly the sheep.

The toy poodle experiment involved 66 large-breed dogs. An average of 17.9 cloned embryos (produced using eggs removed from 46 dogs) were surgically implanted into 20 female dogs. Two dogs developed pregnancies. One pregnancy failed, resulting in a degenerative fetus which was surgically removed. The other was successfully carried to term and removed via Caesarean section. The telomere length of the cloned puppy was similar to that of the 14 year-old dog whose cells were used to clone her. Also, like other cloned animals, the puppy displayed heteroplasmy—meaning she carried DNA from both the dog from whom she was cloned and the dog from whom the egg was taken to produce her embryo. According to the authors, both results related to the dog's heteroplasmy (which can result in high death rates and impairment) and mitochondria (which can relate to obesity and abnormalities) are cause for concern over her fate, and she will be closely monitored.

RNL Bio, Co., Ltd.

In January 2008, RNL Bio, Co., Ltd. (RNL Bio) announced a partnership with SNU's Veterinary Medical Teaching Hospital and the opening of a new center for stem cell treatments and animal cloning commercialization.⁴³ RNL Bio is a biotechnology company based in Seoul, Korea and has a satellite facility (RNL Biostar) in Rockville, Maryland. The U.S. based subsidiary is for clinical development and technology licensing in North and South America. As of May 2008, the company's pet cloning activities are reportedly on hold due to a patent dispute.⁴⁴

In April 2008, RNL Bio announced that, as part of an agreement with the Korean Customs Service and with researchers at SNU, seven yellow Labrador retrievers had been cloned using cells from a dog known to have excellent drug-sniffing skills.⁴⁵ The goal is to produce dogs who can easily be trained in that field.

Booger

Pulling from the Genetic Savings & Clone playbook, RNL Bio announced on Valentine's Day (February 14, 2008) that it had received its first order: to clone Booger, a deceased pit bull dog, for \$150,000 for a California resident, who reported to the press that Booger had saved her life during a mauling by another dog.⁴⁶ The company said that it planned to use preserved ear tissue cells to produce cloned embryos. It plans to implant the cloned embryos into eight female dogs and estimates that one out of four of the dogs will give birth to a cloned puppy.⁴⁷ It also estimates that it can take from three months to one year to produce the cloned dog. Despite saying that the cloned dog would not act exactly like Booger, a RNL Bio salesman said, "Canines die faster than humans, but now people can have the same dog for their whole lives."⁴⁸

A RNL Biostar staff member retrieved Booger's preserved cells from Trans-Ova, a biotechnology company in Iowa that had been paid to store them.⁴⁹ He also visited the veterinary hospital in southern California where Booger's body has been frozen for 18 months, and obtained samples to verify his identification.⁵⁰ The company states that its policy is to charge clients only when a cloned animal has been delivered to them.

Start Licensing, Inc.

Shortly after the news broke about RNL's pet cloning scheme, Start Licensing, Inc. (a joint venture between U.S.-based Geron Corporation and Exeter Life Sciences, Inc., which is a holding company owned by John Sperling) issued a press release stating that it controls Korean patents on animal cloning techniques—including those used to clone dogs—and that RNL Bio is not licensed under them.⁵¹ Start Licensing threatened to take legal action, but has not done so. On May 21, 2008, Start announced that "it granted a sole, worldwide license for the cloning of dogs, cats and endangered species to BioArts International, Ltd."⁵² BioArts is the only entity in the world with the legal right to practice commercial cat and dog cloning.⁵³

CAT CLONING RESEARCH IN SOUTH KOREA

Since the cloning of CC, several experiments have been conducted to improve cat cloning techniques. They have mainly focused on altering methods to increase the survival of cloned embryos.

A cryptic Korean company with no public records that could be found, PetClone Ltd., funded cat cloning experiments conducted jointly by SNU and Sunchon National University in South Korea—the results of which were published in March 2005.⁵⁴ In the experiments, researchers compared the success rates of implanting cloned embryos derived from feline fetal cells and adult cells into cats. They implanted 30-140 cloned embryos into each of seven cats to evaluate the use of fetal cells. The cat implanted with 140 cloned embryos became pregnant and delivered three male kittens, one of whom was stillborn. The other two kittens survived at least four months (the time at which the paper was submitted for publication).

In the experiment involving the use of adult cat cells, 145 cloned embryos were divided among and implanted into three cats. One cat became pregnant and delivered a female kitten who died three days after birth from starvation.

The authors also report that the hair coloring and pattern on the cloned female kitten differed from that of the female cell 'donor.' They add that, "...The pigmentation pattern in multicolored animals is related not only to genetic factors, but also to developmental factors that are not controlled by genotype. The mitochondria inherited from the recipient oocyte [egg] would have a major influence over functions that depend on mitochondria gene expression."⁵⁵ Such factors do not bode well for companies offering carbon copies of cloned pets. The researchers justified their experiment by stating that results are

applicable to improving domestic cat breeding, cloning of endangered felids, and the use of cats as models in biotechnology.

In 2007, results were published about another experiment at Sunchon National University (that also included researchers from SNP Genetics, Inc. and Chungbuk National University, both in Korea) which sought to evaluate two methods of cell treatment and their effect on the efficiency of nuclear transfer and differences between the cloned animals and the cell ‘donor.’⁵⁶ The Korean Science and Engineering Foundation (KOSEF) funded the study. The authors cited cloning of pets as one of the applications of cat cloning technology.

In the experiment, they used cells taken from a white, deaf, odd-eyed* male Turkish Angora cat. 812 cloned embryos were divided (unequally) among and implanted into 18 female cats. Two cats each delivered two kittens, and two cats each delivered one kitten, for a total of six cloned kittens. Of these six, one kitten was stillborn, and another died after three weeks from dehydration as a result of diarrhea. While all of the kittens have a white coat, none of them are deaf or have odd-eye coloring, like the original animal from whom they were cloned. The authors briefly added that the four surviving male kittens were mated successfully with non-cloned cats, resulting in “several live kittens.”

In 2008, the same research team also reported the birth of a second generation of cloned cats.⁵⁷ The main goal of the experiment was to compare the efficiency of second generation cloning using skin cells from a cloned cat and the cat from whom he was cloned. The researchers heavily emphasized the perceived usefulness of genetically ‘identical’ cats for use in human biomedical research and the cloning of endangered felids. The Korean government and KOSEF funded the study.

For the experiments, 78 stray female cats underwent ovariohysterectomy (spay) surgeries to obtain oocytes (eggs) to produce the cloned embryos. Researchers produced 430 cloned embryos using skin cells from the blue-eyed cloned cat, which were divided unequally among and surgically implanted into 15 cats. Four of the cats delivered a total of seven kittens, two of whom were stillborn and one of who died “a few days” after birth due to starvation when the surrogate cat did not allow her to feed. Three of the surviving kittens have blue eyes, while the fourth has odd-colored eyes.

To evaluate the efficiency of cloning a white male odd-eyed cat (to compare with the results of cloning the cloned cat), 126 cloned embryos were divided unequally among and implanted into five cats. One kitten was born, but with two blue eyes.

The authors concluded, “As with other companion animal species, much of the interest in cloning cats has come from the desire of pet owners to replicate a particularly beloved cat. We found that the cloned cats that were derived from the odd-eyed cat were not carbon copies of the donor, as they usually lacked its odd-eye phenotype.”⁵⁸

* Having eyes that each are different colors.

CONCLUSION

Based on the cloning activities investigated in this report, it is clear that cloning cats and dogs is a highly speculative endeavor with questionable motives. Despite the exaggerated claims of some cloning researchers, cloning remains an experimental technology with an extremely high failure rate, causing hundreds of animals to suffer to produce each cloned cat or dog. In addition, numerous cloning attempts have demonstrated that a cloned animal is unlikely to resemble the original physically or behaviorally, yet cloning companies continue to promote the idea that a person can reunite with a beloved companion animal. These companies exploit the human-animal bond in order to make a profit, and people should not be duped by their false promises.

According to the published studies reviewed in this report, a total of 3,656 cloned embryos, more than 320 egg “donors,” and 214 surrogate mothers have been used to produce just five cloned dogs and 11 cloned cats who were able to survive 30 days past birth. That means that more than 500 dogs and cats were kept in small laboratory cages and subjected to painful hormone treatments and invasive surgeries to produce just a handful of cloned animals. These figures include only those cloning experiments that have been published; countless other animals have likely been used.

This hidden toll on animal life makes cloning drastically different than normal animal reproduction. Moreover, whereas dogs and cats are born in litters, so few cloned animals survive until birth that no more than one or two are born at a time. Birth is not the end of the road for cloned animals, either. According to the CEO of a pet cloning company, 15-45 percent of cloned cats who are born alive will die within 30 days.⁵⁹ It is still unknown how the surviving animals will do later in life, as no cloned cat or dog has lived long enough to assess.

Despite the obvious animal welfare and ethical limitations, animals used in pet cloning experiments in the U.S. are not even protected by the minimum humane treatment and care standards set out in the Animal Welfare Act. South Korean regulations appear even laxer. Pet cloning companies, therefore, can operate in almost entire secrecy, without needing to report the number of animals used or the conditions they face because of the experiments. No one knows, for example, what happens to the animals when cloning attempts fail or to the cloned animals who do not pass muster and cannot be sold to a paying client, yet these animals are “copies” of the beloved pets just as much as the “successfully” cloned animals are.

Dog and cat cloning companies, however, continue to mislead the public about the harsh realities of cloning, and instead overhype the potential of a technology that is laden with problems. These companies prey on people’s attachments to their companion animals by promoting false hopes that a deceased pet can be brought back, even as they admit that such a thing is not possible. Yet, as demonstrated in this report, scientific studies show that the personality and appearance of a cloned animal will not necessarily resemble the genetic ‘donor.’

Cloning researchers claim to be aware of demand for cloned pets from wealthy pet owners and report that the price for a cloned pet will drop over time, possibly to \$50,000. However, several surveys have shown that more than 80 percent of the public finds pet cloning to be unacceptable.^{60,61,62}

Revived attempts to turn cloning into a commercial business are little more than money-making schemes designed to take advantage of pet lovers. There will always be attempts by some on the fringe of society to exploit others for profit, but buyers should beware and continue to reject these disreputable activities.

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Appendix A: Pet cloning statistics and failure rates as reported in the published literature

	Timeline/Authors	Total Implanted Embryos	Egg *Donors	Surrogates	Pregnancies	Live Births	Survivors (Day 30)	Failure rates*	Results of Cloned Animals
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	100% - (7) / (2)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Dogs									
	2005 (Lee, <i>et al</i>)	1,095	91 ^a	123	3	2	1	99.9%	1 miscarriage/ 1 neonatal death/1 survivor
	2007 (Jang, <i>et al</i>)	167	23	12	3	3	3	98.2%	3 survivors
	2008 (Jang, <i>et al</i>)	32	82	8	0	0	0	100.0%	N/A
	2008 (Jang, <i>et al</i>)	358	46	20	2	1	1	99.7%	1 miscarriage/ 1 survivor
	Subtotal/Average	1,652	242	163	8	6	5	99.7%	
Cats									
	2002 (Shin <i>et al</i>)	87	NS*	8	2	1	1	98.9%	1 miscarriage/ 1 survivor
	2005 (Yin, <i>et al</i>)	675	NS	10	2	3	2	99.7%	1 stillbirth/1 neonatal death/2 survivors
	2007 (Yin, <i>et al</i>)	812	NS	18	4	5	4	99.5%	1 stillbirth/1 neonatal death/4 survivors
	2008 (Yin, <i>et al</i>)	430	78	15	4	5	4	99.1%	2 stillbirths/1 neonatal death/4 survivors
	Subtotal/Average	2,004	>78	51	12	14	11	99.5%	
	TOTAL/AVERAGE	3,656	> 320	214	20	20	16	99.6%	

*NS=Not stated

^a Authors stated that an average of 12 oocytes were taken from each dog for a total of 1095. Since the number of dogs was not specified, we estimate this using the calculation 1095/12.

Note: These calculations only are based on data from scientific publications. They do not include results from all cat and dog cloning experiments that have been performed in the U.S. and South Korea. Therefore, the total number of cats and dogs who have been used in or born through cloning experiments is unknown.

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Appendix B

Pet Cloning: Animal Welfare Concerns

Animal welfare is significantly compromised by the cloning process, yet the public is largely unaware of the animal exploitation involved with cloning dogs and cats. These animal welfare concerns, listed below, make it clear that cloning is not like normal reproduction, and people who love cats and dogs should continue to reject pet cloning.

- **A tremendous number of animals are used to produce each clone.** Because 99 percent of cloning attempts fail to produce a healthy cloned animal, thousands of embryos and hundreds of egg ‘donors’ and surrogate mothers are used in cloning ventures.
- **Cloning involves invasive and painful procedures.** The egg ‘donors’ and/or surrogate mothers are subjected to painful hormone treatments to manipulate their reproductive cycles. These animals are also subjected to invasive surgery to harvest eggs or implant embryos, and the surrogate mothers endure an additional surgery to deliver the baby.
- **Few cloned animals are born healthy.** Cloned animals rarely survive birth. Of the few who are born, many suffer health problems and die soon thereafter. One pet cloning company CEO has stated that 15-45 percent of cloned cats who are born alive will die within 30 days.
- **The long-term health of cloned animals is unknown.** No cloned cat or dog has lived a full lifespan, so the health problems and veterinary needs they may experience later in life are completely unknown.
- **Animals are kept in research environments.** The cats and dogs used in attempts to clone a pet are typically kept in small, sterile cages.
- **There is little to no oversight of cloning activities.** U.S. researchers and companies who clone cats and dogs for pets are not required to follow the minimum standards of humane treatment and care for animals outlined in the Animal Welfare Act. In addition, there is no way to know how many animals are used in cloning efforts beyond the published studies, or what they must endure as a result of the experiments.
- **Animal life is devalued.** Despite the high price to clone an animal, the animals involved in the cloning process are treated more as objects. Egg ‘donors’ and surrogate mothers are ‘production units,’ and it is unclear what happens to cloned animals who fail to meet expectations.