

Robert Lanza (1956-)

During the twentieth and twenty-first centuries, Robert Paul Lanza studied embryonic stem cells, tissues, and endangered species as chief scientific officer of Advanced Cell Technology, Incorporated in Worcester, Massachusetts. Lanza's team cloned the endangered species of gaur *Bos gaurus*. Although the gaur did not survive long, Lanza successfully cloned another cow-like creature, called the banteng (*Bos javanicus*). Lanza also worked on cloning human embryos to harvest stem cells, which could be used to treat diseases. While previous techniques required the embryo's destruction, Lanza developed a harvesting technique that does not destroy the embryo, forestalling many ethical objections to human embryonic research.

Lanza was born on 11 February 1956. He experienced a childhood that he later said was typical of life in South Boston, Massachusetts. Lanza said that he was not close to his mother and that he struggled to connect with his father, a professional gambler. Lanza recounted exploring what wilderness there was to be found in suburban Boston or spending time in his tree house. Only two of four of his siblings completed secondary school.

In 1966, scientists explained the role of genes in forming proteins. Three years later, in 1969 and at the age of fourteen, Lanza conducted his first experiment involving genes. For a science fair, he altered the color of a chicken's white feathers to be partially black by attempting to induce melanin synthesis. Lanza recalled his motivation to work on the project because his teacher claimed that it was playing God. After completing the experiment, Lanza became frustrated by not having achieved a complete change in pigmentation. He found his way to Harvard Medical School in Boston, Massachusetts, looking to find any professor who would listen about his experiment. Lanza recounted arriving to closed gates, but after accosting someone he thought was a custodian, he found his way inside. The supposed custodian was actually Stephen Kuffler, a scientist who researched the brain and nervous system. Kuffler talked with the young Lanza and introduced him to Joshua Sanes, at that time a graduate student specializing on the nervous system. In 1974, with the help of Kuffler and Sanes, Lanza published his findings in *Nature*.

Lanza attended the University of Pennsylvania in Philadelphia, Pennsylvania, where he graduated in 1978 with an undergraduate degree in biology. As an undergraduate, Lanza worked in the lab of the 1972 Nobel Prize recipient Gerald Edelman at Rockefeller University in New York City, New York, in 1975. At that time, Lanza traveled to the University of Cape Town in Cape Town, South Africa, to learn from Christiaan Barnard, a surgeon who had performed the first human heart transplant.

After graduating in 1978, Lanza worked with disease researcher and polio vaccine creator Jonas Salk at the Salk Institute in San Diego, California. Lanza then spent the summer with psychologist Burrhus F. Skinner at Harvard University in Cambridge, Massachusetts. With Skinner, Lanza conducted experiments on pigeons demonstrating that they can communicate with one another.

Lanza stayed at The University of Pennsylvania for medical school, and he attended the University of Oxford in Oxford, United Kingdom, on a Fulbright fellowship. There, he worked with Edelman's Nobel Prize co-recipient, Rodney Porter, who studied antibodies and their structure. Lanza completed his medical degree in 1983. Then, Lanza took a two year break from research and later said that he went to Los Angeles to understand the universe.

After spending two years in Los Angeles, Lanza contacted and began to work with Patrick Soon-Shiong, a surgeon and medicinal researcher at the University of California in Los Angeles, California, working on insulin-free diabetic treatments. Soon-Shiong transplanted cells called islets, which produce insulin, into diabetic patients. Lanza observed that when foreign islets, such as animal or

cadaver islets, were injected into a patient, rejection rates were high. Lanza recalled that, while working with Barnard in South Africa, he had observed that donor hearts were often rejected by the recipients, just as islets were being rejected in diabetic patients. Soon-Shiong and Lanza extracted islets from the surgically removed pancreas of a diabetic patient. These islets were accepted back by the patient's body after they were encapsulated by an immunological protectant made using algae.

Lanza returned in 1990 to Massachusetts, where chairman of BioHybrid Technologies, William Chick, convinced him to take a research position at the headquarters in Shrewsbury. Lanza continued to refine his encapsulation technique, when researchers at the Roslin Institute at the University of Edinburgh in Edinburgh, Scotland, cloned Dolly the sheep through nuclear transplantation in 1996. Lanza said he began to focus on embryonic stem cells, because cloned embryonic stem cells would not require encapsulation and would not be rejected by the intended host as frequently cells from other organisms. Lanza argued that, because cloned stem cells are genetically identical to the patient they are derived from, the body would not view them as a foreign threat. Chick, whose health had declined and who had suffered a series of strokes, rejected Lanza's arguments. In 1998, Chick died, and Lanza sought employment from a cloning company, Advanced Cell Technologies, Inc. (ACT), near the BioHybrid headquarters.

In 1999, Lanza joined ACT as its vice president of medical and scientific development. In 2001, Lanza cloned endangered animal, an Asian ox (the gaur or *Bos gaurus*) using somatic cell nuclear transfer. Lanza had removed the nucleus from a cow's egg cell, into which he transplanted a nucleus from a somatic cell from a gaur. The hybrid egg was then implanted in a surrogate cow and, after fetal development, the infant gaur was born, although it only lived for a few minutes. In 2003, ACT cloned another cow-like animal, the banteng (*Bos javanicus*), which into the early decades of the twenty first century, lived in the San Diego Zoo in San Diego, California.

ACT sought to research and clone human embryonic cells in addition to animal cells, but in 2001 the President of the United States, George W. Bush, blocked new federal funds for research into stem cells that used cells from embryos previously uncultured. Michael West, the ACT's chief executive officer, claimed that ACT researchers produced the first cloned human embryo soon after Bush's decision in late 2001. West's claims were shown to be spurious, engendering public distrust towards ACT. Lanza continued to promote and represent ACT despite the fallout and the discontinuation of ACT's involvement in human embryonic research.

In 2003, along with new ACT colleagues Young Chung and Irina Klimanskaya, Lanza reinitiated human embryonic experiments after continued successes on animal cells. The team received approval from external ethics boards and, with money from ACT's animal research, they cloned a sixteen cell embryo.

Lanza and ACT struggled for funds because the government still would not fund stem cell research into new stem cell lines, so they relied on private funds. Lanza's new project was to use stem cells to counteract degenerative blindness. In 2010, Lanza and his team received 25 million dollars from investors and, in 2012, he attained federal approval to start clinical trials on therapies.

Lanza and synthetic biologist George Church, from Harvard Medical School in Boston, Massachusetts, established a new company. The company aimed to further research on induced pluripotent stem cells to address issues of reproduction for livestock and possibly to clone organisms from extinct species. Into the twenty-first century, Lanza, a bachelor, lived on a small island in the middle of a lake in Clinton, Massachusetts.

Sources

1. Bethge, Phillip. "Non-embryonic stem cells: The dawning of a new era of hope." Spiegel Online, April 5, 2013. <http://www.spiegel.de/international/spiegel/researchers-launch-trials-with-non-embryonic-stem-cells-a-892475.html> (Accessed October 24, 2013).
2. Campbell, Keith, Jim McWhir, William Ritchie, and Ian Wilmut. "Sheep cloned by nuclear transfer from a cultured cell line." *Nature* 380 (1996): 64-6.

3. Cibelli, Jose B., Ann A. Kiessling, Kerriane Cunniff, Charlotte Richards, Robert P. Lanza, and Michael D. West. "Rapid communication: somatic cell nuclear transfer in humans: pronuclear and early embryonic development." *e-biomed: The Journal of Regenerative Medicine* 2 (2001): 25-31.
4. Epstein, Robert, Robert P. Lanza, and Barrhus F. Skinner. "'Self-awareness' in the pigeon." *Science* 212 (1981): 695-6.
5. Fischer, Joannie. "The first clone." *U.S. News & World Report*, November 11, 2001. <http://www.robertlanza.com/the-first-clone/> (Accessed February 5, 2015).
6. George W. Bush White House Archives. "President Discusses Stem Cell Research." The White House. <http://georgewbush-whitehouse.archives.gov/news/releases/2001/08/20010809-2.html> (Accessed February 5, 2015).
7. Kim, Dohoon, Chun-Hyung Kim, Jung-Il Moon, Young-Gie Chung, Mi-Yoon Chang, Baek-Soo Han, Sanghyeok Ko, Eungi Yang, Kwang Yul Cha, Robert Lanza, and Kwang-Soo Kim. "Generation of human induced pluripotent stem cells by direct delivery of reprogramming proteins." *Cell Stem Cell* 4 (2009): 472-76. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2705327/> (Accessed February 10, 2015).
8. Lanza, Robert P. "Alteration of melanocytes by DNA in White Plymouth Rock chickens." *Nature* 252 (1974): 597-8.
9. Lanza, Robert, Robert Langer, and Joseph P. Vacanti, eds. *Principles of Tissue Engineering*. Burlington, MA: Elsevier Academic Press, 2011.
10. Lanza, Robert P., Jose B. Cibelli, and Michael D. West. "Human therapeutic cloning." *Nature Medicine* 5 (1999): 975-977. http://www.nature.com/nm/journal/v5/n9/full/nm0999_975.html (Accessed February 10, 2015).
11. Lanza, Robert P., Robert Jackson, Alison Sullivan, John Ringeling, Claire McGrath, Willem Kuhlreiber, and William Chick. "Xenotransplantation of cells using biodegradable microcapsules." *Transplantation* 67 (1999): 1105-11. <http://www.centerspan.org/pubs/transplantation/1999/0427/tr089901105p.pdf> (Accessed February 5, 2015).
12. Lanza, Robert P., Jose B. Cibelli, Francisca Diaz, Carlos T. Moraes, Peter W. Farin, Charlotte E. Farin, Carolyn J. Hammer, Michael D. West, and Philip Damiani. "Cloning of an endangered species (*Bos gaurus*) using interspecies nuclear transfer." *Cloning* 2 (2000): 79-90.
13. Lok, Corie. "Stem-cell research: Never say die." *Nature News* 481 (2012): 130-3 <http://www.nature.com/news/stem-cell-research-never-say-die-1.9759> (Accessed on October 24, 2013).
14. Regalado, Antonio. "A stealthy de-extinction startup." *MIT Technology Review*. <http://www.technologyreview.com/view/512671/a-stealthy-de-extinction-startup/> (Accessed October 24, 2013).
15. Rohm, Wendy G. "Seven days of creation." *Wired Magazine*, January 2004. http://www.wired.com/wired/archive/12.01/clones.html?pg=1&topic=&topic_set= (Accessed October 24, 2013).
16. Schwartz, Steven D., Jean-Pierre Hubschman, Gad Heilwell, Valentina Franco-Cardenas, Carolyn K. Pan, Rosaleen M. Ostrick, Edmund Mickunas, Roger Gay, Irina Klimanskaya, and Robert Lanza. "Embryonic stem cell trials for macular degeneration: a preliminary report." *The Lancet* 379 (2012): 713-20.
17. Soon-Shiong Patrick, Rau Heintz, Takako Fujioka, Paul Terasaki, Noma Merideth, and Robert Lanza. "Utilization of anti-acinar cell monoclonal antibodies in the purification of rat and canine islets." *Hormone and Metabolic Research Supplement* 25 (1990): 45-50.
18. *The Lancet*. "Robert Lanza." November 19, 2005. <http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2805%2967716-1/fulltext> (Accessed October 24, 2013).
19. Weintraub, Pamela. "Fighting for the Right to Clone." *Discover Magazine*, August, 19, 2008. <http://discovermagazine.com/2008/sep/19-fighting-for-the-right-to-clone/#.UmsuVxC7aYN> (Accessed October 24, 2013).
20. Woodward, A. "Robert Lanza." In *Newsmakers 2004 Cumulation*, ed. Laura Avery, 272-4. Detroit, MI: Gale Virtual Reference Library, 2004. Reprinted in *Encyclopedia of World Biography*. <http://www.notablebiographies.com/newsmakers2/2004-Ko-Pr/Lanza-Robert.html> (Accessed February 10, 2015).