Karl Oskar Illmensee (1939–) [1]

By: Lancaster, Cheryl

Karl Oskar Illmensee studied the cloning [2] and reproduction of fruit flies, mice, and humans [3] in the US and Europe during the twentieth and twenty-first centuries. Illmensee used nuclear transfer techniques (cloning [2]) to create early mouse [4] embryos from adult mouse [4] cells, a technique biologists used in later decades to help explain how embryonic cells function during development. In the early 1980s, Illmensee faced accusations of fraud when others were unable to replicate the results of his experiments with cloned mouse [4] embryos. Illmensee also worked with human embryos, investigating how embryos split to form identical twins.

Illmensee was born in Lindau, Austria, in 1939. At the Ludwig Maximilians Universität in München, Germany, he studied chemistry and biology before beginning his PhD research in the Zoologisches Institut der Universität in München, Germany. Illmensee studied the developmental genetics of fruit flies. Two other researchers, Robert Briggs and Thomas King at the American Institute for Cancer Research [5] in Washington, USA, had cloned frogs in the 1950s. Illmensee attempted to use Briggs and King’s method to clone fruit flies [6].

Despite failing to clone an adult fly, Illmensee published the results of his research in 1968. Illmensee exchanged the nucleus [7] of an unfertilized fly egg [2] with a nucleus [7] from a fertilized fly egg [2], a process called nuclear transplantation. Of the 118 eggs that had undergone nuclear transplantation, 11 began to develop, and one developed into the larval stage, the stage right before adulthood in fruit flies. Illmensee had not cloned an adult fly, but he had created a clone that survived to the larval stage of development. He completed his PhD in 1972.


In 1981, at the University of Geneva [4], Illmensee and Hoppe transplanted nuclei from embryonic mouse [4] cells into fertilized mouse [4] eggs that lacked a nucleus, a process called nuclear transfer. The eggs developed to the early blastocyst [6] stage in the lab before being transferred to pseudopregnant female mice. Hoppe and Illmensee transfected 179 developing eggs and recorded three live births. Later, those mice produced offspring that had traits and characteristics of the genes [8] contained in the donated nucleus [4]. Illmensee and Hoppe published their results, and the report attracted worldwide press attention. Following the above work, in 1981, Illmensee received the Marcel Benoist research prize for the most useful scientific discovery in Switzerland or by a Swiss national in the previous year.


By June 1983, the popular press reported the accusations, and other researchers began to make statements about Illmensee’s work. Several researchers admitted they had attempted unsuccessfully to reproduce the results Illmensee and Hoppe had reported in 1981. For example, James McGrath and Davor Solter at the University of Geneva [4] in June 1983, comprised of lawyers and experts in mammalian development. Neither the Roscoe B. Memorial Laboratories nor the University of Geneva internal review board offered evidence of fraud. Likewise, the external review team accepted Illmensee’s version of events but conceded that Illmensee kept poor records. The external reviewers recommended that Illmensee repeat his work alongside international collaborators, starting with the transfer of mouse [4] teratocarcinoma nuclei to enucleated fertilized mouse [4] eggs.

In 1988, Illmensee left the University of Geneva [4] and became professor of molecular embryology [2] at the University of Salzburg in Salzburg, Austria. Illmensee worked on repeating the work requested by the external reviewers. In one article published in 1989 and 1990, Illmensee repeated the required work with Jayek A. Medowitsch at the University of Warsaw in Warsaw, Poland. D. Gerhaurzer at the University of Geneva [4], and B. Looi of the University of Naples in Naples, Italy. None of those experiments resulted in live births. However, Illmensee stated that he had demonstrated the potential of his nuclear transfer techniques.

During the 1990s, Illmensee studied mammalian reproduction, including the biochemistry of human eggs, and the development of organs in the mouse [4] embryo. In 1996, Illmensee became professor of reproductive medicine at the University Hospital in Innsbruck, Austria.


In the early 2000s, Illmensee published papers about improving artificial reproductive technology [3] (ART) techniques. He discussed a technique called embryo splitting in mice. In the technique, half of the cells from an early embryo were removed and grown in the lab to create two embryos from one. In 2006, Illmensee and Zavos published a paper on somatic cell nuclear transfer [26] (SCNT). SCNT involves removing a nucleus [7] from a cell, and inserting that nucleus [7] into another cell that has its original nucleus [7] removed. In their work, Illmensee and Zavos cultured cells from an infertile man in the lab. They fused Zavos’s cells from the infertile man with eggs [2] from the man’s wife, and allowed the cell to develop in the lab. Once the cells [7] developed to the four-cell stage, Illmensee and Zavos transferred the early embryo to the uterus [2] of the woman, but the pregnancy [10] did not continue.


At the Genees Fertility Center in Patras, Greece, Illmensee began working with Mike Levanduski. They also worked at American Fertility Services in New York City. New York, Illmensee and Levanduski studied embryo splitting, a process that can occur in pregnant women and results in identical twins. Levanduski and Illmensee created human embryos to split in the laboratory, reporting their results in 2010. As the split human embryos progressed to a further stage of development, Levanduski and Illmensee suggested that embryo splitting might be useful for artificial reproductive technologies (ART).

In 2017, Illmensee continued to work at the Genees Fertility Center in Patras, Greece, continuing his research on ART methods.
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**Subject**
- University of Geneva
- Cloning
- Molecular cloning
- Clone cells
- Taxis
- Embryos
- Cell nuclei—Transplantation
- Mouse
- Teratocarcinoma
- Reproduction
- Minir. Beatrice
- Assisted human reproduction
- Human reproductive technology
- Reproductive technology

**Topic**
- People
- People

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