Ericsson Method of Sperm Separation

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In 1973, Ronald Ericsson developed the Ericsson method, which is a technique used to separate human male sperm cells by their genetic material. Ericsson, a physician and reproduction researcher, developed the method while conducting research on sperm separation in Germany, in the early 1970s. He found that sperm cells that carry male-producing Y chromosomes move through liquid faster than the cells that carry female-producing X chromosomes. As a result of his findings, Ericsson suggested suspending a sperm sample in a viscous liquid made from albumin protein, and collecting only sperm cells that quickly pass through the liquid. Shortly after Ericsson described his method, researchers demonstrated that it was effective for sex selection. However, later studies contested those results. Despite that, the Ericsson method is still utilized by couples in 2018 as a means of sex selection.

Humans have two sex chromosomes, one passed down from each parent, which affect their biological sex characteristics. People with two X chromosomes are biologically female, while people with one X and one Y chromosome are biologically male. Since females have two X chromosomes, they are able to contribute only an X chromosome to their offspring. Males have both X and Y chromosomes and can therefore contribute either an X or a Y chromosome to their offspring. Therefore, male sperm cells are responsible for determining the sex of an embryo. If the male sperm cell that fertilizes a female egg contains a Y chromosome, the embryo is male. If the male sperm cell that fertilizes the female egg contains an X chromosome, the embryo is female. The mechanism of sex determination is explained by the ability of sperm cells to move throughout the female reproductive tract to reach and fertilize an egg, to enter into their capacity for swimming. A sperm’s swimming ability can indicate how successfully the sperm can reach and fertilize an egg.

During the late twentieth century, emerging research suggested a difference between X chromosome-bearing sperm cells and Y chromosome-bearing sperm cells. In the 1960s, Landrum B. Shettles, a researcher and physician who specialized in human reproduction, claimed that there were physical differences between the two types of male sperm cells. Shettles’s idea stimulated interest in the field of reproductive health, as the separation of sperm cells is responsible for determining the sex of an embryo. If the male sperm cell that fertilizes a female egg contains a Y chromosome, the embryo is male. If the male sperm cell that fertilizes the female egg contains an X chromosome, the embryo is female. The mechanism of sex determination is explained by the ability of sperm cells to move throughout the female reproductive tract to reach and fertilize an egg, to enter into their capacity for swimming. A sperm’s swimming ability can indicate how successfully the sperm can reach and fertilize an egg.

In its early development, the Ericsson method’s primary use was not for preconception sex selection. In December 1974, Ericsson patented his method and included the objectives of he spermatogenesis separation technique, which he listed in order of importance. Ericsson’s primary objective was to provide a process for separating human male sperm samples into two groups that have an enriched concentration of sperm cells carrying Y chromosomes. He then tested the enhanced Y chromosome-bearing sperm fraction for artificial insemination, to increase the likelihood of male offspring, and did not perform any actions on how to do so in the patent. However, artificial insemination, the process in which sperm cells are injected directly into a female’s uterus, was already a common practice at the time Ericsson patented his method. In order for someone to use the Ericsson method for preconception sex selection, couples would need to inject the Y chromosome-bearing sperm cells directly into a female’s uterus, with an egg, using a syringe after the sperm cells are separated through the albumin medium. In his patent, Ericsson briefly mentioned that the method could be used for family planning. He claimed that a strong desire to have a child of a particular sex often causes couples to have many children until their favored sex is achieved, and that utilizing his method of sperm separation for preconception sex selection would reduce the society’s chance of possible overpopulation.

Two years after its initial development, a clinical trial tested the Ericsson method for preconception sex selection. Prior to that clinical trial, studies had shown that the method was effective for collecting semen samples with high concentrations of Y chromosome carrying sperm cells. But there was no evidence that those samples successfully created male offspring because they had not yet been tested using artificial insemination, with the exception of a few samples from a healthy man. In 1975, physician Paul Dinsmore, who specialized in obstetrics and gynecology and his team of researchers at the University of Illinois, conducted a clinical trial to test whether the separated samples produced by the Ericsson method affected the sex ratio of human offspring. During that initial clinical trial, physicians successfully impregnated seven women using artificial insemination with sperm cells that were separated by the Ericsson method. Of those seven, five were delivered male infants. The researchers involved in the initial clinical trial determined that when sperm cells are separated using the Ericsson method and artificially inseminated for preconception, there is an increased chance of producing male infants.

Despite that clinical trial, further studies have supported the effectiveness of the Ericsson method. In 1976, Ericsson began a clinical trial in collaboration with Ferdinand Beernink, an obstetrician and gynecologist at the University of Chicago. There, Ericsson and his research team tested whether the separated samples produced by the Ericsson method affected the sex ratio of human offspring. During that initial clinical trial, physicians successfully impregnated seven women using artificial insemination with sperm cells that were separated by the Ericsson method. Of those seven, five were delivered male infants. The researchers involved in the initial clinical trial determined that when sperm cells are separated using the Ericsson method and artificially inseminated for preconception, there is an increased chance of producing male infants.

In 1977, another study published in Human Reproduction attempted to make definitive conclusions on the effectiveness of the Ericsson method. That study replicated the original methods exactly, and also addressed the alterations made in previous studies that did not confirm Ericsson’s initial results. The experiment was conducted at Taichung Veterans General Hospital’s Department of Obstetrics and Gynecology in Taichung, Taiwan. The researchers examined 3,918 semen samples from two healthy males. Even after following Ericsson’s methods precisely, the researchers failed to show that Ericsson’s albumin separation technique produced a difference in the sex ratio of sperm cells. However, the results did not confirm Ericsson’s results from his initial study. Despite the inconclusive data that both supports and invalidates the Ericsson method, the method is still utilized for sex selection at Gametrics Limited. As of 2018, Ericsson is the president of Gametrics Limited, a company he created that has exclusive access to his patented method of sperm separation using albumin columns. While the company’s headquarters are in Alzado, Montana, it has laboratories, called Sperm Centers, which offer the Ericsson albumin method both in the US and internationally. According to the Gametrics Limited website, thousands of children have been born using sperm separation in combination with artificial insemination to enable people to select the sex of their children.

Sources

Despite that, the Ericsson method is still utilized by couples in 2018 as a means of sex selection and was the first sperm separation technique used in combination with artificial insemination to enable people to select the sex of their children.

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- Sperm
- Male gametes
- Spermatozoa
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- X-Chromosome-Bearing Sperm
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