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 sperms in isolation in Berlin, Germany, in the early 1970s. He found that the sperms that carry male-producing Y chromosomes move through liquid faster than those that carry female-producing X chromosomes. This phenomenon allows for the isolation of sperms in vivo using albumin protein, and collecting only sperms 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 and was the first sperm separation technique used in combination with artificial insemination to enable people to select the sex of their children.

Humans have two sex chromosomes, one of which can be either X or Y. Females have one X chromosome and one Y chromosome, which is biologically male, whereas males have one X chromosome and one Y chromosome and 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 therefore, are able to contribute both X and Y chromosomes to their offspring. Males have both X and Y chromosomes and can therefore contribute Y chromosome-bearing sperms to their offspring. Ericsson and his colleagues conducted research on sperms in isolation in Berlin, Germany, in the early 1970s and demonstrated that the sperms that quickly pass through the liquid contained Y chromosome-bearing sperms. Ericsson and his colleagues then collected and separated sperms that contained Y chromosome-bearing sperms and fertilized them with eggs. The sperms that were able to fertilize the eggs were found to be Y chromosome-bearing sperms, and therefore, the offspring were male.

In the early 1970s, Ericsson, a physician who specialized in reproductive hormones, conducted research on sperm separation in Berlin, Germany. There, he worked for Schering AG, a pharmaceutical company, as a senior researcher. During an experiment in 1973, Ericsson found that a liquid medium of albumin, a viscous protein surrounding human female eggs, that sperms must swim through for fertilization to occur, effectively separated Y chromosome-bearing sperms from sperms not carrying Y chromosomes. To test his ideas further, Ericsson filled glass tubes, and separation columns, with the albumin liquid medium and observed how sperms swam through it. Later that same year, he published his findings in an article titled "Isolation of Fractions Rich in Human Y Sperm" that explained how the albumin columns work to separate sperm cells.

In his experiment, Ericsson took a sperm sample and placed it on top of a solution of 25 percent liquid albumin in a glass column. The sperms' cells would then swim down the column through the albumin over a two- to a four-hour incubation period at 37 degrees Celsius. After a certain amount of time, Ericsson collected the sperm cells at the top of the column and washed and stained them with a fluorescent chemical, termed fluorochrome quinacrine, a fluorescent chemical, to determine which sex chromosome the remaining sperms carried. Prior research had demonstrated that fluorochrome quinacrine caused the far end of the Y chromosome, called the Y body, to glow under fluorescent microscopes. With microscopic examination, 80 percent of sperms in the separated sample carried Y chromosomes.

With that result, Ericsson and his team determined that albumin was the most appropriate medium to effectively separate sperms by their genetic material that the sperms carry. The albumin is the ideal consistency for sperm separation because it increases the mobility of poorly swimming sperms. Ericsson then conducted research to see if the sex ratio was affected. However, the results did not confirm Ericsson's findings from his initial study. In their article, the authors claimed that to date, the Ericsson method was the only clinical method of pre-conception sex selection. Two years after its initial development, a clinical trial tested the Ericsson method for pre-conception sex selection. Prior to that clinical trial, studies had shown that the method was effective for collecting sperms samples with high concentrations of Y chromosome-bearing sperms. However, there was no evidence that those samples successfully created male offspring because they had not yet been tested using artificial insemination, as there were still X chromosomes present in the sample. In 1973, Shettles, a reproductive endocrinologist, demonstrated that the Ericsson method was effective for sex selection. However, the results did not confirm that the method was effective for sex selection. Two years after its initial development, a clinical trial tested the Ericsson method for pre-conception sex selection. Prior to that clinical trial, studies had shown that the method was effective for collecting sperms samples with high concentrations of Y chromosome-bearing sperms. However, there was no evidence that those samples successfully created male offspring because they had not yet been tested using artificial insemination, as there were still X chromosomes present in the sample.

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Sources
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