

It's a Girl!

Is sex selection the first step to designer children?

By KATHLEEN FACKELMANN



Some parents-to-be hope for a girl. Some wish for a boy. The outcome, however, has always been pretty much a matter of chance.

Researchers at the Genetics & IVF Institute in Fairfax, Va., recently announced a technique that helps stack the odds in favor of parents getting what they want. Using a mechanical sperm sorter, the Fairfax team reported that nearly 93 percent of the babies born were of the desired sex.

All the couples in this study wanted girls. However, the technique also can easily help those who desire a boy. Will such technology lead to a United States overpopulated by one sex? Most ethicists don't think that will happen any time soon. Nonetheless, the new technology raises some concerns about the future, they say.

Before getting to the ethical debate about sex selection, consider the research itself. Reproductive biologist Edward F. Fugger and his colleagues at the Genetics & IVF Institute began their study by recruiting 119 couples who wanted a baby girl. In most cases, the couples already had a boy or boys, and they wanted a girl for variety—to balance their family, as the scientists say. In a few cases, couples faced the risk of giving birth to a child with a genetic

disorder that strikes boys only.

The patented sperm sorter used by Fugger and his team helps parents pick out the child's gender before fertilization of the egg. The technology, developed during animal studies by Lawrence A. Johnson of the U.S. Department of Agriculture in Beltsville, Md., exploits the difference in amounts of DNA in X and Y chromosomes. Sperm bearing the X, or female, chromosome have more DNA than sperm carrying the Y, or male, chromosome.

An embryo resulting from the merger of an egg, which always carries an X chromosome, and a sperm carrying an X chromosome will have two Xs and, therefore, develop into a girl. An egg fertilized by a sperm carrying a Y chromosome becomes a boy.

In the September issue of *HUMAN REPRODUCTION*, Fugger and his colleagues describe their use of the method. Each couple provided a sperm sample, which the researchers treated with a dye that attaches to DNA and glows under laser light. The team then exposed the tagged sperm to a laser beam.

The researchers reasoned that the X-carrying sperm would glow the brightest under the laser light. Sure enough, even though sperm carrying an X chromosome—and 22 other chromosomes—contain only 2.8 percent more DNA than those bearing a Y, the sorter separated the bright sperm from the dim sperm. It

then directed most of those bearing X chromosomes to swim down one collection tube, and most of the Y-bearing sperm went down another tube.

When the researchers analyzed the sperm in the X collection tube, they found that 85 percent had the X chromosome, as desired. The researchers thus estimate that samples from the X collection tubes are five to six times as likely to result in a girl baby than in a boy.

In 92 cases, the researchers inserted the sorted sperm directly into the woman's uterus, a procedure called intrauterine insemination. In this version of artificial insemination, the sperm must latch onto and fertilize an egg in the woman's body for pregnancy to occur.

Some of the couples required more complex—and expensive—techniques to achieve pregnancy. In 27 cases, the researchers united sperm and egg in a laboratory dish and then transferred the resulting embryos to the woman's uterus.

Out of 119 women, 29 got pregnant using the sorted sperm. In 8 women, the pregnancy ended in miscarriage or surgery, the latter because of a dangerous condition in which the fertilized egg starts to grow in a fallopian tube above the uterus. At the time the Fairfax researchers published their journal article, 12 women had ongoing pregnancies and 9 women had already delivered 11 babies, including two sets of twins. As of

mid-November, Fugger and his colleagues had not released updated results.

Of the 14 pregnancies in which the gender of the child had been determined, 13 were girls, the researchers say.

Fugger and his team are also conducting a study with parents who want boys. In such cases, the sperm sorter is less effective at concentrating Y-bearing sperm. Still, the method yields a sperm sample in which 65 percent carry the Y chromosome, Fugger says. The team has not announced any results of that study yet.

The researchers identified no safety concerns in the published study. "All of the babies born have been healthy," Fugger says. "That doesn't mean that all of the risk has been excluded," he says. "There's a lot that's not known."

The study raised more concerns than just the usual fear about side effects. For some people, a technology that could pick out the sex of a baby raises the specter of China's overabundance of baby boys.

Many Chinese couples opt for an abortion of a female fetus if they lose the natural-reproduction lottery by not conceiving a boy, notes ethicist R. Alta Charo of the University of Wisconsin-Madison. As a result, China has experienced some significant demographic shifts, Charo notes.

Most people in the United States recoil at the thought of a society so geared toward male offspring that abortion—and even infanticide—is the fate of some baby girls. Indeed, Arthur Caplan of the University of Pennsylvania's Center for Bioethics says most U.S. couples have only a moderate preference for a child of a given sex. If they lose the reproduction lottery for the gender they desire, they

rarely opt for an abortion, he says.

Furthermore, Caplan says that only a small subset of the U.S. population would try to ensure their baby's gender with this expensive, difficult technique. Charo agrees, noting that a man must first produce a sperm sample for the doctor. Then, his partner must submit to artificial insemination or other techniques performed in a doctor's office or clinic.

Of course, Charo notes, for couples who can have children no other way, the difficulties of such high-tech reproductive methods are a small price to pay for a successful pregnancy. But for couples whose only concern is the gender of their baby, the rigmarole might very well put them off.

Caplan argues that sex selection to balance a family is ethically acceptable but that it won't be popular enough in the United States to change Mother Nature's gender sorting.

He wonders whether the preference for a boy or a girl stems from inherently sexist attitudes. Does a U.S. parent's desire for a boy or a girl mean that one sex is viewed as inferior to the other? "Sex selection doesn't bother us—sexism does," Caplan says.

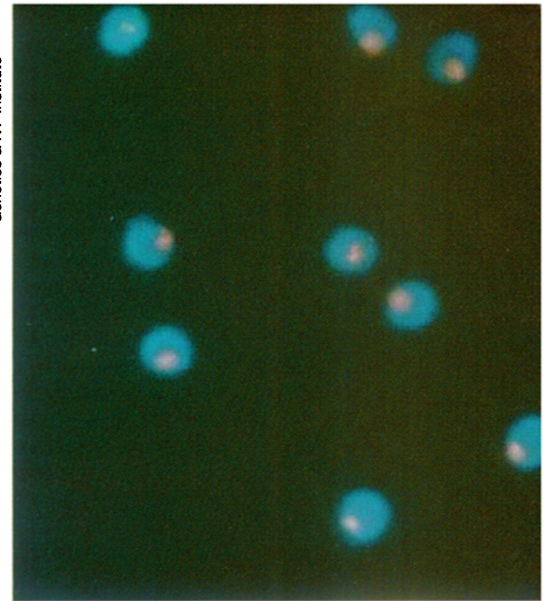
Sex ratios and sexism aside, some ethicists worry about a culture where parents are driven to pick out any of the traits of their unborn children. "There's a notion now that parenting is a kind of consumer experience," says Barbara Katz Rothman, a sociologist at the City University of New York.

Rothman, for example, worries about parents who choose a sex because they are seeking to fill stereotypical, perhaps unrealistic roles. For example, a woman who hopes for a girl may say she wants to shop for a prom gown or go for manicures with a daughter. "You listen to this woman and think, 'This woman is not prepared for a 300-pound, 6-foot girl who wears denim and boots,'" Rothman says.

The trend toward more parental control over a child's characteristics will increase in the future, warns biomedical ethicist Thomas H. Murray, the director of the Center for Biomedical Ethics at Case Western Reserve University in Cleveland. Murray notes that scientists working on the human genome project soon will have methods of identifying disease-causing genes as well as the DNA that produces characteristics such as hair color, height, athletic ability, and perhaps some behaviors.

Most ethicists see no problem with parents trying to avoid a genetic disease in their offspring, but Murray and others say that parents should leave the selection of nondisease traits to fate.

"As consumers, we think, 'The more choice the better,'" he says. But even rudimentary attempts to pick one trait from column A and one from column B



Sperm treated with a dye that attaches to DNA glow pink if they carry an X, or female, chromosome and green if they carry a Y, or male, chromosome. X-bearing sperm are predominant in this enriched sample.

might encourage the belief that parents can design the perfect baby, Murray says. Substantially increased parental control over their tyke's personality may change the dynamics of the parent-child relationship, he adds.

Charo says that selecting a child's sex is a far cry from designing a baby. Indeed, while parents can now pay for sorting X- and Y-carrying sperm, the technology hasn't been invented that could guarantee a red-haired cellist with a genius-level IQ.

She adds that sex-selection techniques may be useful to limit the size of all-girl families where the parents might otherwise continue having babies until they get a son or of all-boy families intent on having a girl. "This technology would let couples up the odds that their next kid will be the last kid," Charo says.

Caplan and Charo both propose that regulation of the technology is not necessary. "The presumption in the United States is that you let people do what they want unless there is a very good reason to stop them," Charo says. "In the United States today, the harm [of sex selection] is not that great."

Although lawmakers may never regulate sex-selection methods, Murray contends that genetic counselors should begin developing guidelines to steer couples away from the designer-baby concept. The harm to society from attempts to select human characteristics may be subtle, he says. For example, how will parents who think that they have designed a child act toward that offspring when a wrong trait shows up?

Rothman says that even with all the human reproductive genetic advances, one thing should remain the same: "When you parent, you get what you get." □



Researchers at Genetics & IVF Institute used a laser-based sperm sorter to increase the odds that Monique and Scott Collins would have a girl. They did: Jessica Collins, born Aug. 13, 1996.