The future of babymaking
Scientists explore new techniques for tackling infertility problems

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July 22, 2003 - Just a few decades ago, it seemed pretty far-fetched to think that postmenopausal women could ever bear children or that sterile men might fertilize eggs with sluggish sperm. But researchers have overcome these and other medical challenges in the quarter-century since the birth of 'test-tube' baby Louise Brown, a landmark event that brought the promise of parenthood to millions of infertile couples. So what will the future of fertility hold? Transplanted wombs? Immortal eggs? Cloned babies?

Since Brown was born in July 1978, doctors have been steadily tweaking fertility techniques — and boosting their effectiveness.

"The field has come a long way," says Dr. Richard Paulson, director of reproductive endocrinology and infertility at the University of Southern California in Los Angeles.

Success rates for in vitro fertilization procedures, in which egg and sperm cells are combined in a lab dish, and other variations of assisted reproductive technology are at an all-time high. In 2000, the latest year for which U.S. statistics are available, about 25 percent of treatment cycles involving a woman’s own eggs resulted in a live birth.

Doctors attribute improved success rates to such factors as better culture media — the fluid that embryos are bathed in at the lab — and the ability to grow many embryos for as long as five days before transfer to the uterus, up from two or three days in the past.

Selecting better embryos
To boost birth rates higher, scientists are working to perfect current methods as well as develop new ones.

One area of research is the development of better techniques to identify which embryos are the best candidates for transfer to a woman’s uterus.

Some doctors currently use a screening method called preimplantation genetic diagnosis, or PGD, which involves removing a single cell from an embryo and testing it for genetic defects.

The approach can be beneficial for women who suffer repeat miscarriages due to chromosomal abnormalities, but doctors say it has not proven its worth as a routine screening technique for all patients.

Among its drawbacks, PGD can damage embryos and may not always give accurate results because one cell does not necessarily reflect the health of the entire embryo, according to Paulson. An improvement, he says, would be a noninvasive test that would provide more precise information, perhaps using a special microscope.

"The principle of PGD — testing the embryo to see whether the DNA is right or wrong — is clearly the way of the future," says Paulson.

PGD is also being used increasingly with some fertile couples to screen embryos for genetic conditions, such as cystic fibrosis and Huntington’s disease. But experts say they’re still a long way from being able to “fix” embryos by altering their DNA.

Some researchers also fear PGD will be used to create “designer babies” with specific traits that have nothing to do with their health. The technology is already being used in some cases solely to choose a child’s sex.
“When does it stop being a medically oriented procedure?” asks Dr. Randy Morris, an associate professor of reproductive endocrinology at the University of Illinois in Chicago.

“Do sex now, and eye color and free-throw-shooting ability later? Whether society will tolerate that remains to be seen,” says Morris.

Slowing the biological clock
Another major goal of researchers is to figure out how to preserve a woman’s fertility, which begins a nose dive in her mid-30s. Scientists are trying to understand why eggs deteriorate and how to thwart the process.

While doctors have long been attempting to freeze eggs so that a young career woman, for instance, could save them for use later in life, the process is not very successful because the eggs are so fragile, says Dr. Michael Soules, director of reproductive endocrinology and infertility at the University of Washington in Seattle.

“It’s not good enough to be attractive,” he says.

One approach that may make egg freezing more successful is in vitro maturation, in which immature eggs are extracted from the ovaries and matured in the lab. Immature eggs seem to survive freezing better than mature eggs, raising the possibility that doctors may one day harvest and freeze the immature eggs and then thaw and mature them when a woman is ready to start a family.

The benefit of in vitro maturation in routine ART is that it prevents women from having to undergo hormone injections to stimulate their ovaries to release multiple mature eggs. The technique has already been used to conceive some children but is still being investigated.

Eggs in abundance
Other high-tech tinkering may one day allow for an abundant supply of new eggs or the rejuvenation of old ones. Scientists, for instance, have coaxed embryonic stem cells from mice to morph into eggs in the lab. If the feat could be replicated in humans, it might offer an alternative for infertile couples who would otherwise need to rely on donor eggs, which may be in short supply.

Other investigators have proposed a technique that involves taking the nucleus from an infertile woman’s adult cell, such as a blood or skin cell, and putting it into a hollowed-out egg from a donor. The goal is to create an egg that has the genetic material of the infertile woman and is healthy enough to be fertilized with her partner’s sperm.

But experimentation with this technique and another approach called cytoplasmic transfer, both of which involve genetic manipulation beyond the direct union of egg and sperm, were halted by the Food and Drug Administration in 2001, pending agency approval.

During cytoplasmic transfer, cytoplasm — the part of the cell outside of the nucleus — from a healthy donor egg is injected into an egg of an infertile woman in an effort to make her egg healthier. Babies have already been created with the technique and, because cytoplasm contains small amounts of genetic material, the kids have been shown to have DNA from three genetic parents — two moms and a dad — raising red flags with the FDA.

Transplanted or artificial wombs?
Science may also have something new in store for women who are born without a uterus or who must have it removed for health reasons — uterine transplants.

Doctors in Saudi Arabia say they’ve transplanted a uterus into a woman but it had to be removed after a few months because of blood-clotting problems. Other researchers in Sweden have performed uterus transplants in mice, which were then able to give birth.

Since the ideal donor would be a close genetic match, such as a mother or sister, the ability to perform uterine transplants might actually make it possible for a woman to give birth from the same uterus she was born from.
Uterine transplants would offer an alternative to surrogacy but, on the downside, would require patients to take anti-rejection drugs to prevent their immune systems from attacking the organ.

Taking things even further, if embryos can be created outside the womb, why can’t the fetus develop there, too, eliminating the need for a uterus altogether?

Experts say the ability to fertilize and grow an embryo outside the human body for a few days has been an amazing achievement, but one that would pale in comparison to being able to nurture a fetus to term in the lab.

“We’re just excited we can grow the embryo to day 5,” says Dr. Sherman Silber, director of the Infertility Center of St. Louis at St. Luke’s Hospital. “Artificial womb — I just don’t see that happening.”

Cloning conundrum
Meanwhile, the debate over human cloning continues to rage. Yet amid all the ethical and moral concerns, fertility specialists are skeptical human cloning would ever really be a practical — or desirable — option for infertile couples.

But experts aren’t saying that it necessarily can’t be done.

“It’s possible, if you go by all the different animals that have been cloned,” says Soules.

But based on the animal experiments, scientists have learned that cloning efforts fail the vast majority of the time and are plagued by high rates of birth defects and other problems.

So what about those recent cloned-baby claims by Clonaid, a company linked to the Raelian movement that believes space aliens created humans by cloning themselves?

“They’re totally out in left field,” Silber says.

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