Test Screens Live ‘Test Tube’ Embryos

A new technique allows physicians to perform genetic tests on a living, human "test tube" embryo before implanting the embryo in the mother's womb, British researchers report.

None of the tested embryos has yet been implanted. But if further tests indicate the procedure is safe—and evidence so far suggests it is—researchers may perform the first such implantation within the next two months.

The technique would give a mother the option of rejecting a genetically abnormal embryo before a physician implants it. As such, it may reduce the number of clinical abortions performed on the basis of more commonplace genetic tests, such as amniocentesis, which can only be performed in pregnancy.

Researchers say the procedure could lead to an increased demand for in vitro fertilization, beyond that of today's prime candidates—women with fertility problems—to include fertile women at high risk of passing an inherited disease to their offspring.

"I think the possibilities are really enormous," says Suheil J. Muasher, director of the Jones Institute for Reproductive Medicine at the Eastern Virginia Medical School in Norfolk. "I think this is the way for the future. But it has to be proven safe first. And I think more animal work needs to be done before going into humans.

Physicians and researchers in the past decade have witnessed remarkable advances in their ability to test for genetic defects in human fetuses. Amniocentesis, which can detect fetal chromosomal abnormalities after about 15 weeks of gestation, has served as a low-risk means of gender determination and genetic analysis since the mid-1970s. And chorionic villus sampling, although not proven as safe as amniocentesis, can now detect genetic defects by the eighth week of pregnancy. Until now, however, genetic tests on live, preimplantation human embryos had not been performed, says Alan H. Handsides of the Hammersmith Hospital in London. Handsides and Jonathan K. Patterson of the Clinical Research Center in Harrow describe with their colleagues the first such successful testing in the Feb. 18 LANCET.

In their initial experiments, the researchers looked not for genetic errors but for gender-determining genes in 3-day-old human embryos they had grown in culture. The gender test would be useful to mothers who harbor genes for so-called sex-linked diseases, including muscular dystrophy, hemophilia and a rare syndrome called Lesch-Nyhan. Such women may choose to give birth only to girls, because these diseases show up almost exclusively in males.

The researchers removed a single cell from each of 30 embryos, leaving the remaining five to nine cells of each embryo intact. Using a highly sensitive "gene amplification" technique called polymerase chain reaction (PCR) (SN: 4/23/88, p.262), they sought within these single cells a gene sequence unique to the male-determining Y chromosome. As later confirmed by traditional chromosome testing methods—which generally take more time and require more genetic material than a single cell can offer—the technique proved correct in every instance.

Researchers have used a variety of PCR techniques to detect gene sequences in the cells of adults with genetic diseases. As more of these tests become available, specialists should be able to test embryos for these diseases as well, Handsides told SCIENCE NEWS. For example, he and his colleagues have already begun experiments to detect cystic fibrosis genes in preimplantation embryos using PCR.

Handsides says evidence from their lab and elsewhere indicates that human embryos develop normally even if two—and possibly three—of the initial eight cells are lost early in development. "So we're fairly secure that removing one cell from this very early stage should not cause any specific defects," he says.

He and his colleagues now await ethics-committee approval to implant gene-tested embryos that are short one cell.

— R. Weiss