SCIENCE NEWS of the week

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. Handyside of the Hammersmith Hospital in London. Handyside and Jonathan K. Pattinson 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 tests 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, Handyside told SCIENCE NEWS. For example, he and his colleagues have already begun experiments to detect cystic fibrosis genes in preimplantation embryos using PCR.

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

– R. Weiss

Signs of an ancient worldwide wallop

Years, perhaps decades, will pass before scientists agree on a basic theory to explain why a vast number of species went extinct some 66 million years ago. Now entering the debate is one more piece of evidence suggesting an extraterrestrial body hit the Earth at that time, which is known as the Cretaceous-Tertiary (K-T) boundary.

John McHone and his colleagues at Arizona State University in Tempe report in the March 3 SCIENCE that they have detected a mineral called stishovite in samples collected from the K-T boundary at Raton, N.M. McHone says natural stishovite has not been found anywhere on Earth except at sites connected with impacts, and its presence at the K-T boundary proves that at least one body, such as a comet or meteorite, struck the planet then. "Stishovite just clinches it," he says. "There was an impact."

The researchers detected the minute amounts of stishovite through two techniques, nuclear magnetic resonance and X-ray diffraction. In the past, scientists studying the K-T boundary have found only hints of this mineral.

Luis and Walter Alvarez started the modern K-T debate in 1979 when they first proposed an impact caused the mass extinctions that extinguished the dinosaurs, among others. They raised the theory to explain high concentrations of the element iridium they had found in a thin layer of clay at the K-T boundary. Iridium is rare in the crust but is concentrated in the deep earth and extraterrestrial objects.

The Alvarez group suggested the colliding body would have vaporized on impact, and hurled up iridium-rich dust that blacked out the world. Settling back to the surface, the dust would have formed the global clay layer seen at the K-T boundary. Researchers have since found more impact evidence at the boundary, such as mineral grains deformed by a high-pressure shock wave.

Another group argues instead that an intense period of volcanic eruptions altered the Earth's climate and caused species to disappear, some abruptly and some perhaps gradually over millions of years. As evidence for the volcanic theory, these scientists have maintained that volcanoes can bring iridium-rich rock from the Earth's mantle to the surface. Violent eruptions may also produce limited kinds of shocked mineral grains (SN: 4/18/87, p.248).

Many scientists believe, however, that volcanoes cannot produce stishovite, a dense form of silica formed by extreme pressures. The important thing about stishovite is that it breaks down when heated. Even temperatures as low as 300°C, if prolonged, will make the mineral revert to a less dense form of silica, so it cannot survive in a volcanic environment, McHone says.

The stishovite discovery has convinced some scientists but not all. "I think McHone's find is very important. But to take it as a confirming nail in the coffin is far too preliminary," says Neville Carter, an expert in shocked minerals at Texas A&M University in College Station. In any case, the new information does not address how an impact affected life. Much evidence suggests an impact did not act alone in causing the extinctions.

– R. Monastersky