Koreans Report Ease in Cloning for Stem Cells

By GINA KOLATA

South Korean researchers are reporting today that they have developed a highly efficient recipe for producing human embryos through cloning, and then extracting their stem cells.

Writing in the journal Science, the researchers, led by Dr. Woo Suk Hwang and Dr. Shin Yong Moon of Seoul National University, said they used their method to produce 11 human stem cell lines that were genetic matches of patients who ranged in age from 2 to 56.

The method, called therapeutic cloning, is one of the great hopes of the stem cell field. It produces stem cells, universal cells that are extracted from embryos, killing the embryos in the process, and that, in theory, can be directed to grow into any of the body's cell types.

Because the stem cells come from embryos that are clones of individuals, they would be exact genetic matches and less likely to be rejected by a patient's immune system. Scientists want to obtain such stem cells from patients with certain disorders and illnesses to study the origin of diseases and to develop replacement cells that would be identical to those a patient has lost in a disease like Parkinson's.

Dr. Hwang said he had no intention of using the method to produce babies that were clones. "Our proposal is limited to finding a way to cure disease," he said. "That is our proposal and our research goal."

Previously, the same group produced a single stem cell line from a cloned embryo, but the process was so onerous that many scientists said it was not worth trying to repeat it, and some doubted that the South Koreans' report was even correct.

Things have changed.

The new finding buoyed researchers who had wanted to use such stem cells to study diseases but had thought it would be years, if ever, before it would be practical to obtain them. "It is a tremendous advance," said Dr. Leonard Zon, a stem cell researcher at Harvard Medical School and the president of the International Society for Stem Cell Research, who was not involved in the research.

But the report raised concerns among others, who said it was a step down the slippery slope leading to cloned babies. Richard Doerflinger, whose title is director of pro-life activities at the United States Conference of Catholic Bishops, said: "Up until now, people were beginning to wonder whether human cloning for any purpose was feasible at all. This development makes it feasible enough to be a clear and present danger."

The Korean report will influence the political debate over embryonic stem cell research, which is unfolding on Capitol Hill. The House is expected to vote as early as next week on a measure that would expand federal financing for embryonic stem cell studies. The measure, which has created deep divisions among Republicans, does not address therapeutic cloning. But a second bill, introduced by Senator Orrin G. Hatch, Republican of Utah, would permit taxpayer financing of therapeutic cloning studies, while prohibiting cloning for reproduction.

In their new work, the South Korean researchers produced stem cells that were exact matches for 9 of 11 patients, including 8 adults with spinal cord injuries and 3 children - a 10-year-old boy with a spinal cord injury, a 6-year-old girl with diabetes and a 2-year-old boy with congenital hypogammaglobulinemia, a genetic disorder of the immune system. Dr. Zon cautioned that "it will take a lot of work" before stem cells fulfill their promises in medicine, but he said the new finding would bring scientists significantly closer to the goals.

Dr. Hwang said he had been flooded by requests from researchers who wanted to visit and study his methods, including Dr. Ian Wilmut, the researcher in Scotland who created the first cloned mammal, a sheep named Dolly, in 1996, astonishing scientists who had thought cloning was biologically impossible. Dr. Wilmut visited the laboratory in Seoul, and this week Dr. Hwang went to Dr. Wilmut's laboratory at the Roslin Institute in Edinburgh to help him in his quest to produce human embryos by cloning and to extract their stem cells.

Others are trying too. In England, the International Center for Life, in Newcastle upon Tyne, announced it had produced a human embryo by cloning, although it did not say it had extracted stem cells or gone through the many detailed steps to prove that they were stem cells and that they were from a clone, as the South Koreans had done.
Until now, scientists had been studying human embryonic stem cells extracted from embryos created for that purpose and did not involve cloning cells from specific patients. They had also obtained stem cells from embryos created at fertility clinics and donated by couples who no longer needed them. In addition, scientists are studying mouse stem cells, working on the difficult task of directing the cells to develop into specific tissue types.

But researchers wanted embryos that were genetic matches of patients. The only way to do that was to use embryos that were clones of patients, and human cloning had seemed all but impossible.

To produce a clone, scientists slip the genetic material from a patient's cell into an unfertilized egg from another person whose genetic material has been removed. The genes from the patient's cell take over, directing the egg to divide and develop into an embryo that is genetically identical to the patient. About five days later, when the cloned embryo contains about 100 cells and is about 0.08 inch in diameter, it changes its form, looking like a ball of cells encased in a sphere. That ball of cells, when removed and grown in the laboratory, becomes the embryonic stem cells.

The process, however, fails more often than it succeeds, and, in humans, it seemed to fail almost all the time. In a previous report, published last February, Dr. Hwang and Dr. Moon used 248 human eggs to produce a single embryonic stem cell line, a group of cells that came from one embryonic cell and could grow on a petri dish.

But this time, with a handful of technical improvements that mostly involved methods for growing cells and breaking open embryos, they used an average of 17 eggs per stem cell line and could almost guarantee success with the eggs of just one woman obtained in a single month. It did not matter whether the patient whose cells were being cloned was young or middle-aged, male or female, sick or well - the process worked.

"You almost have no reason not to do it," said Dr. Davor Solter, the director of the Max Planck Institute for Immunobiology in Freiburg, Germany. He added that it seemed more efficient to clone and obtain human stem cells than to do the same experiment in animals, although no one knows why.

Seven states ban any type of human cloning and 11 have laws that prevent embryonic stem cell research, said Lori B. Andrews, a law professor at Chicago-Kent College of Law, and federal money is restricted to research using stem cell lines approved by the Bush administration in 2001. Where such work is legal, however, increasing numbers of scientists, including Dr. Zon, say they have private financing and plan to go forward using cloning to produce stem cells.

Dr. John Gearhart, a stem cell researcher at Johns Hopkins University, said the new paper would provide an impetus. "I think you will see more people in the game," he said.

Not everyone is excited.

Dr. Leon Kass, chairman of the President's Council on Bioethics, commented in an e-mail message that "whatever its technical merit, this research is morally troubling: it creates human embryos solely for research, makes it much easier to produce cloned babies, and exploits women as egg donors not for their benefit."

The South Korean government, which paid for the new study, has made it a crime to implant a cloned embryo into a woman's uterus, Dr. Hwang said. "It should be banned throughout the world," he added.

The study included 18 women who provided eggs.

The South Korean scientists worked hard, said Dr. Gerald Schatten of the University of Pittsburgh School of Medicine, who visited their laboratory and helped the scientists, whose English is limited, write their paper.

"They work 365 days a year except for leap year, when they work 366 days," Dr. Schatten said. "They have lab meetings at 6:30 every morning except Sunday, when they have them at 8."

Few would venture into the cloning arena if the science was not so promising, researchers say. Of course, they say, there is a long way to go from stem cells to therapy.

"It's going to take a lot of work," said Dr. Ronald McKay, a stem cell researcher at the National Institutes of Health. "But we want this to work - it's not a theory. My technical and professional judgment tells me this is really important."

Dr. Kass, however, says that cloning and extracting stem cells from the embryos is not the only way to do such work. A majority of the President's Council on Bioethics called for a moratorium on cloning for research, he said, and the council recently suggested other ways of getting stem cells that could develop into the desired tissue types and that would match a patient's own cells "without these violations and moral hazards."

Opinion polls have had varied results, often depending on the words that are used to describe the work. In a recent Gallup poll, just 38 percent of respondents approved of cloning embryos for research. Another poll, which used the term "somatic cell nuclear transfer" instead of "cloning," found that 72 percent approved.
Dr. Hwang's paper goes a step further, using "S.C.N.T." instead of "somatic cell nuclear transfer."

Dr. Ruth Faden, the executive director of the bioethics center at Johns Hopkins, said the moral debate would change if the research led to new treatments with dramatic benefits for some patients. "That could really shake it up," she said.

But Dr. Richard Land, the president of the Southern Baptist Convention's ethics and religious liberty commission, said his group would not be assuaged.

"We believe a cloned embryo is a human being," Dr. Land said. "We should not be the kind of society that kills our tiniest human beings in order to seek a treatment for older and bigger human beings."

Sheryl Gay Stolberg contributed reporting from Washington for this article.