

Who's Leading The Way?

(By Micah Morrison)

While Americans debate profound moral questions about stem cells—particularly those derived from human embryos or fetal tissue—and Congress battles over bills to fund research, scientists outside the U.S. are making advances that one day might help us understand how diseases develop and possibly provide new treatments, even cures. We asked investigative reporter Micah Morrison to look at the state of stem cell research around the world.

TO THE BELIEVERS—AND THEY are legion—a revolution is at hand in medical science. Around the globe, scientists are racing to understand and harness the power of stem cells, the basic building blocks of the body. From these microscopic wonders, all our other cells are formed—the ones that create our organs, nerves, muscles, blood, bones and brain. If we can control the incredible morphing power of these progenitor cells, scientists reason, the sky's the limit. Stem cells could be used to replace damaged cells with new ones, opening the door to cures for diabetes, for example, or Parkinson's and genetic blood diseases. Failing organs could be restored through drug therapies that reinvigorate stem cells. Paralyzing injuries might be reversed through stem cell injections.

But experts warn that U.S. researchers might be falling behind. "We're in a new era of globalization of scientific talent, materials and tools. If we don't have these tools, like embryonic stem cell research, other countries may move ahead of us," says Anne



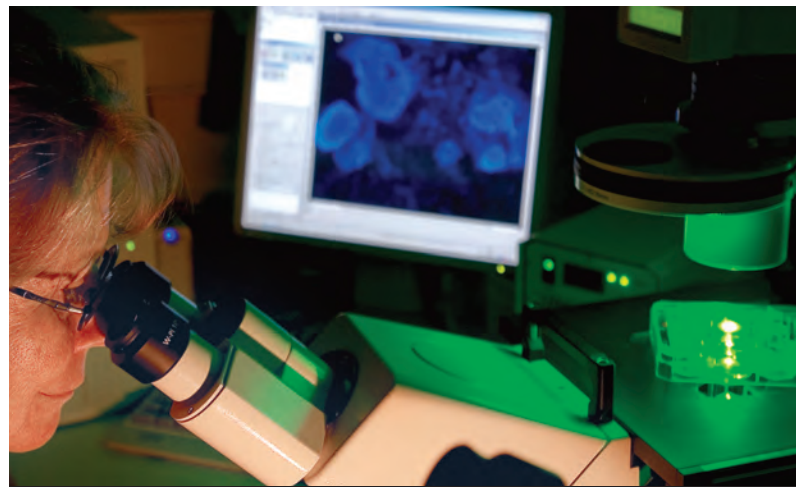
Solomon, director of the Biotechnology and Public Policy Initiative at the Center for Strategic and International Studies (CSIS) in Washington, D.C.

While there are pockets of scientific ferment all over the world, including the U.S., the following five countries are making important advances:

South Korea. Led by Dr. Woo Suk Hwang of Seoul National University, researchers electrified the scientific community in May with the announcement that they had refined a process to clone stem cells in human embryos—a procedure called nuclear transfer, or therapeutic cloning. This vaulted the Asian nation to the forefront of stem cell science.

In this method, scientists remove the nucleus—or genetic material—from an egg provided by a healthy donor. Cells from a patient are then transplanted into the egg, which will divide, become an

In the global race to understand stem cells and their healing potential, some experts worry that the U.S. is in danger of falling behind.



GREAT BRITAIN

A technician works in a lab at the Cambridge Stem Cell Institute in Britain. An American researcher, Dr. Roger A. Pedersen, directs a stem cell program there.

SOUTH KOREA

Seoul National University researcher Dr. Woo Suk Hwang continues to refine a method to produce cloned human stem cells from embryos in the lab.

In Asia especially, training people in science and technology has become a priority.

early-stage embryo, and develop stem cells that are a genetic match to the patient's. In theory, these cloned stem cells can be removed and later used in the patient to combat a specific disease

or repair damaged organs by growing new tissue. The new South Korean process, Dr. Hwang tells PARADE, "is the first proof of the concept that using therapeutic cloning for treatment [of disease] may be in reach." Another potential benefit: studying cloned stem cells in a petri dish to understand how diseases develop.

The South Korean government takes an active role in financing stem cell research—a matter of national pride in this small country as well as a bid for international prestige. Our moral debate in the U.S. over stem cell research does not have the same resonance in many parts of Asia, where life is often viewed as beginning at birth, not conception.

China. As in South Korea, China's scientists benefit from regulatory standards less strict than ours. The government supports many stem cell initiatives and encourages partnerships with private industry.

Western researchers say China is impossible to ignore. Last year, the British government's Department of Trade and Industry (DTI) sent top scientists to survey stem cell research in Asia. Among their findings: China is "at, or approaching, the forefront of international stem cell research." China engages in "significant recruitment" of U.S. and other Western scientists, the DTI report noted, luring them with promises of greater freedom and well-funded centers.



SINGAPORE

The Biopolis research complex gets \$1.5 billion in government funding and attracts renowned scientists.

Singapore. The development of stem cell science is a national priority in Singapore. The crown jewel of that effort: Biopolis, a dazzling mini-city of cutting-edge laboratories and offices drawing biotech companies and some of the best researchers from around the world. The country has committed more than \$1.5 billion to Biopolis. "Singapore is formidable," says CSIS's Anne Solomon. She points to another important card the region holds: education. "In Asia especially, countries have made training people in science and technology a top priority."

Israel. Israeli scientists have been leaders in the use of embryonic stem cells to study diabetes, heart disease and cancer. Jewish religious law places high value on the principle that everything possible must be done to save lives. This has provided a kind of moral platform for medical experimentation and enabled Israelis to reach a consensus on the issue.

Last year, the government launched an innovative \$20 million effort to bring together private companies, hospitals and academic research centers. "Stem cell research needs enormous resources," says Peretz Lavie, a vice president at the Technion-Israel Institute of Technology. "Government alone or academia alone cannot provide such resources."

continued

Taking Our Pulse

The PARADE/
Research!America
Health Poll

Stem Cell Research: What Americans Think

The majority of Americans support embryonic stem cell research, yet a core minority is consistently opposed to it. At the same time, the number supporting or opposing the research fluctuates as distinctions are made. Those are the conclusions of a wide-ranging national poll commissioned by PARADE and Research!America, a nonprofit public education and advocacy group. Our poll also found that many Americans do not follow the issue closely or fully understand the science behind it—though that number is shrinking with more media coverage. Here are some of the results:

Americans say the U.S. should be a world leader in research.

How important do you think it is that the U.S. is a global leader in medical and scientific research?

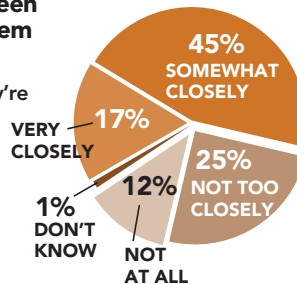
Most Americans think it is "very important" (78%) or "somewhat important" (17%).

How important is it for the U.S. to educate and train individuals qualified to conduct medical and health research?

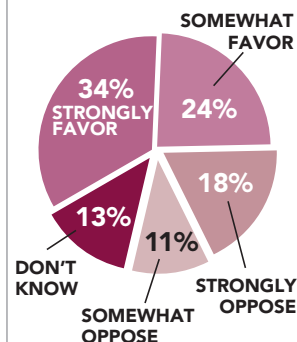
Most Americans said it is "very important" (90%) or "somewhat important" (9%).

How closely have you been following the issue of stem cell research?

Many people admit that they're not following the debate on stem cell research closely, while a minority on both sides is intensely involved. Yet even without extensive knowledge, Americans are forming opinions on the subject, as it has become a major national issue.



Do you favor or oppose medical research using embryonic stem cells?



When asked the question without any explanatory information, 58% said they "strongly favor" or "somewhat favor" stem cell research, while 29% said they "strongly oppose" or "somewhat oppose" it, and 13% did not express an opinion.

If you are opposed to embryonic stem cell research, is that opposition based on religious objections or on other grounds?

Religious objections were cited by 57%, while 39% said they objected on "other grounds."

Americans make distinctions between types of stem cell research.

1. Scientists can extract embryonic stem cells from fertilized eggs that are voluntarily donated by fertility clinic patients. These fertilized eggs would otherwise be discarded. Knowing this, do you favor or oppose embryonic stem cell research?

The debate in Congress is about funding for this source of stem cells. While 62% said they "favor" such research, 31% said they "oppose" it, and 7% said "don't know."

3. Scientists now can make embryonic stem cells for medical research by merging an unfertilized egg with a skin cell, for example. In other words, no fertilization takes place and there is no merger of egg and sperm. Knowing this, do you favor or oppose embryonic stem cell research.

In the absence of fertilization, more people were supportive of the research (also called therapeutic cloning): 69% said they "favor" it, 22% continue to "oppose" it, and 9% said they "don't know."

2. Reproductive cloning is the use of cloning technology to create a child. Do you think that research into reproductive cloning should be allowed?

Here is where many people draw the line. Even those who support embryonic stem cell research oppose research into cloning a child: 79% said it should not be allowed. Still, a surprising 16% said it should, while 5% answered "don't know."

4. Therapeutic cloning is the use of cloning technology to help in the search for possible cures and treatments for diseases and disabilities. Do you think that research into therapeutic cloning should be allowed?

Language matters. When asked about this method without using the term "therapeutic cloning" (see No. 3), 69% favored it and 22% were opposed. When it was described using that term, the number of supporters decreased to 59%, while 35% opposed it. The remaining 6% answered "don't know."

Our poll of 1000 people, representing a cross-section of Americans, has a sampling error of $\pm 3.1\%$.



For more results of this PARADE/Research!America Health Poll, visit www.researchamerica.org on the Web.

Great Britain. The United Kingdom has long been a leader in embryo sciences, creating groundbreaking fertility procedures in the 1970s and cloning Dolly the sheep in 1996. (A leader of the sheep-cloning team, Dr. Alan Colman, is now CEO of a medical stem cell company in Singapore.) Last year, Britain created the world's first national stem cell bank. The bank and the government's Human Fertilization and Embryology Authority are seen by many as a model for scientific progress and controls: The government authority licenses stem cell work, while the bank acts as a secure repository for the cells, monitoring their distribution and use.



Actor Michael J. Fox created a foundation in 2000 that promotes stem cell research for Parkinson's disease.

Hope and Optimism

The promise of embryonic stem cell science remains just that—a promise. Adult stem cells, derived primarily from blood, have helped thousands with leukemia and genetic disorders. Embryonic stem cell research, still relatively new, has yet to produce any groundbreaking cell therapy cures—and may never, some critics say. But that hasn't stopped scientists from believing in their potential.

“In a world perspective, I see a lot of hope, a lot of optimism,” says Dr. Laurance Johnston, a biochemist and former National Institutes of Health official. “But because of regulatory barriers, few things are happening in the U.S.”

There is no federal statute outlawing embryonic stem cell research here—the barriers are largely due to restrictions placed on the use of federal research dollars. So, while Congress

PHOTO BY KEVIN MAZUR/WIREIMAGE.COM

A Glossary

- ▶▶ **Stem Cell:** A single cell that can regenerate and turn itself into one of several types of specialized cells. Some primary sources: embryos, adult tissues and umbilical-cord blood.
- ▶▶ **Embryonic cell:** An unspecialized cell that may turn itself into any type of tissue, such as a muscle or nerve cell. Derived primarily from frozen *in vitro* fertilization embryos. The most versatile type of cell.
- ▶▶ **Adult cell:** A more specialized cell found in many kinds of tissue, such as bone marrow, skin and the liver. Can't become all types of cells. Transplanted adult blood cells are used to treat blood diseases.
- ▶▶ **Umbilical-cord cell:** A rich source of precursors of mature blood cells, drawn from umbilical-cord blood. Used to treat blood diseases. May contain other types of stem cells.
- ▶▶ **Nuclear transfer (therapeutic cloning):** A method to transform an individual's specialized cells into primitive embryonic stem cells using cloning technology.

and President Bush wrestle over funding, states are moving to fill the gap. Last year, for example, the citizens of California approved a \$3 billion state program to create an institute for stem cell research. If it survives legal challenges, the institute will become a world-class competitor almost overnight. Still, experts feel that federal funding and regulation are critical.

For America, the big questions seem to be: Is the British model one that could work here? Would the standards of South Korea and China be acceptable to U.S. society? Can we reach some sort of moral consensus? Or will we slip behind as well-meaning partisans on both sides of the stem cell divide continue their fierce battles over a terrain fraught with ethical and moral challenges? 