

BIOTECH

ASIA IS STEM CELL CENTRAL

Singapore and others are racing to grab the lead in a promising field

HOW DO YOU FOLLOW UP on Dolly the Sheep? For Alan Colman, an English biochemist and a leader of the British team that created the first cloned mammal in 1997, the answer was to abandon the cold moors, heaths, and braes of Scotland for steamy Singapore. But it wasn't the tropical weather that drew Colman. Instead, the 56-year-old scientist chose the city-state because of its tolerant climate for research using embryonic stem cells. Not yet assigned specific roles in the body, these cells are like blank slates that scientists hope can be used to treat many different diseases. But because the cells are taken from human embryos, funding for such research has been restricted in the U.S. since 2001. Singapore, by contrast, is creating "a center of excellence in stem cell research," Colman says, and there's plenty of funding there, too.

That's part of Singapore's effort to build a biotech industry. The government has established a \$600 million fund to invest in startups engaged in research on stem cells and other cutting-edge life-sciences projects. Last year, Singapore opened Biopolis, a 2 million-square-foot complex of laboratories and offices devoted to such

research. So far, Singapore has ponied up \$22 million for ES Cell International, the Biopolis-based company where Colman has worked as chief scientific officer since 2002. ES today owns six stem-cell lines (a line is a group of identical cells that come from the same embryo) and is focusing on developing treatments for diabetes. "Here, there's huge support," says Robert Klupacs, ES Cell's chief executive officer.

"ASTONISHING" PROGRESS

SINGAPORE ISN'T THE only country in the region trying to profit from the U.S. restrictions. Australia, China, India, Japan, and South Korea all see stem cell research as a way to get ahead in biotech. The

The Asian Alternative

The region is stepping into the breach as federal funding in the United States remains limited.

SINGAPORE Last year opened Biopolis, a state-owned life sciences center where top scientists are using stem cells to search for a diabetes cure, and a leader of the team that cloned Dolly the sheep is continuing his research.

KOREA Since the U.S. limited funding on embryonic stem cell research, Seoul National University has developed 36 stem cell lines, one of the world's largest collections.

CHINA Beijing and Shanghai have major stem cell centers, and overseas patients with life-threatening illnesses are traveling to China for experimental treatments using stem cells.

AUSTRALIA Last year started allowing the use of embryos for stem-cell research; spending \$25 million on a new national stem cell center near Melbourne that will house up to 200 scientists.



progress the Asians have made is "astounding," says Robert A. Goldstein, chief scientific officer at New York-based Juvenile Diabetes Research Foundation International, which has teamed up with Singapore in funding ES Cell's efforts to find a cure for the disease. Many governments have been asking themselves: "Since the U.S. doesn't seem to be taking a lead role, why don't we?" observes Goldstein.

What has created this opportunity? President George W. Bush put drastic restraints on federal funding for embryonic stem cell research in the U.S. three years ago because many religious conservatives oppose use of the cells, which often come from embryos left over after in-vitro fertilization. Given the different religious traditions of Asia, the debate isn't as heated. "We don't have an ethical roadblock," says D. Balasubramanian, chairman of the Indian government's stem cell task force.

Despite the progress the Asians have made, many sci-

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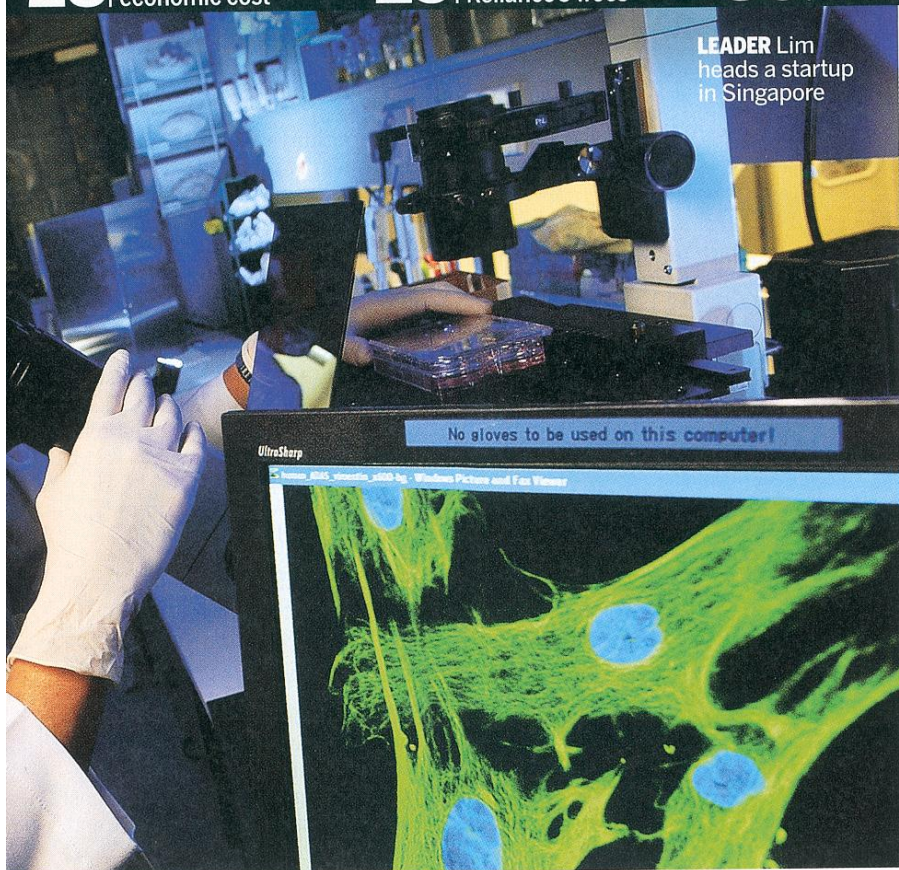
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29 | The fallout from Reliance's woes

30 | A new small-car contender in Europe

33 | Ukraine's rocky road toward the West

LEADER Lim heads a startup in Singapore



entists say they remain years away from developing real therapies using stem cells. Nonetheless, there is anecdotal evidence of early progress. A Chinese lab is looking into using stem cells to treat amyotrophic lateral sclerosis (ALS), or Lou Gehrig's disease. And in October researchers at Korea's Chosun University said they had transplanted stem cells into a 37-year-old woman suffering from a spinal cord injury, partially restoring her ability to walk—though there has been no independent confirmation of this claim. "We didn't expect the patient to recover like this," says Chosun professor Song Chang Hun. "It's almost like a miracle."

Some governments have focused on importing talent. China, for instance, has recruited scientists from top universities in the U.S. to run research centers on the mainland. And in Singapore, 32-year-old Soren Müller Bested, a self-described "gene jockey" from Denmark, is now the chief technology officer for Cordlife, a company that focuses on preserving and researching stem cells found in human umbilical cords. Bested and others involved in stem-cell work say the government's unflagging support gives confi-

dence to scientists worried about shifting political winds. "You won't find out overnight that what you've been working on for five years has been banned," he says.

Still, Asian countries are far from assured of leading the way in stem cells over the long term. One big question is whether local universities can produce enough top-notch researchers, since relying on imported scientists won't work in the long run. Another concern is what some critics see as a lax approach to oversight and ethics in some labs, including the use of stem cells drawn from fetuses aborted in the second trimester in China.

More worrisome for the Asians is the growth in alternative sources of funding for stem cell research in the U.S. While Bush's reelection ensured that the National Institutes of Health will not be opening its coffers to U.S.-based researchers in embryonic stem cells, on Election Day voters in California approved Proposition 71, which will provide

The Asian players will soon face a strong rival: The state of California

\$300 million a year to scientists conducting such research in the state. That will make it harder for the Asians to attract top scientists. Seoul, for instance, has dished out a total of just \$27 million over the past two years in public money for stem cell research. Funding in Singapore and other countries also pales in comparison to what California plans to spend. "There's going to be a very impressive network" in California, says Randy Schekman, a professor of cell and developmental biology at the University of California at Berkeley and an adviser to the Singapore government. While he admires the "gung ho attitude" of Singaporean policymakers, Schekman says Proposition 71's basketload of money could overwhelm what the Asians can offer. "We are going to attract an awful lot of people who will be eager to move" to the Golden State, says Schekman.

California may not be the only worry. Britain has a relatively liberal policy toward stem cell research and may soon kick-start funding for it. And at least five other U.S. states are looking to fund stem cell research, too. Even some of Asia's most prominent boosters concede that the region will have a tough time matching what the Americans have to spend.

Singapore is building a scientific community, but currently "it's sub-optimal," says Colman. "The people who wrote Prop 71 are trying to recruit people right now. And when those top people go, so will their teams."

The Asians insist they're still in the running, and that increased funding for research—wherever it takes place—will ultimately help everyone in the field. "I don't

think any one country can monopolize stem cell research," says Susan Lim, chairman of Stem Cell Technologies, a Singapore startup focusing on ways to extract adult stem cells from fat tissue. California's research effort will attract attention, but "Korea, Singapore, and China will be even more committed to pursuing it," says Hwang Woo Suk, a researcher at Seoul National University. Now that they have a strong foothold, the Asians aren't about to give up, even as the climate for stem cell research improves elsewhere. ■

—By Bruce Einhorn in Singapore, with Jennifer Veale in Seoul and Manjeet Kripalani in Bombay