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Science Haven in Singapore

By WAYNE ARNOLD

SINGAPORE, Aug. 16 — You can't buy Wrigley's Spearmint gum in Singapore. But human embryonic stem cells? That's a different matter.

Last month a local company, ES Cell International, claimed to be the first company to commercially produce human embryonic stem cell lines in a way that makes them suitable for clinical trials. Researchers can buy vials of stem cells from ES Cell over the Internet for \$6,000.

Singapore, notably conservative on most social issues — including a ban on most types of chewing gum — is emerging as a hotbed for stem cell research, thanks to liberal laws in that field and equally liberal government financing.

Lately the tiny island-state's ambition of joining the ranks of Boston and the Bay Area as a biotech hub has been getting a hand from an unexpected quarter: the White House. Bush administration policies that restrict federal money for stem cell research have prompted an increasing number of top scientists to pack their bags and head for this equatorial city.

Two of America's most prominent cancer researchers, Neal G. Copeland and Nancy A. Jenkins, are planning to arrive here next month to take posts at the Institute of Molecular and Cell Biology. The husband-and-wife team, who worked for 20 years at the [National Cancer Institute](#) in Maryland, said politics and budget cuts had left financing in the United States too hard to come by.

"We wanted to be in a place where they are excited by science and things are moving upward," said Dr. Copeland, who said he and his wife had already rented a condominium near Singapore's shopping district and had joined the local American Club.

Scientists say President Bush's veto last month of legislation to raise limits on federal financing for stem cell research was the latest in a series of setbacks, which they say are stifling the research environment and eroding the edge in basic medical science that the United States has held since World War II.

Shrinking research grants, a greater corporate emphasis on quick profits and the political firestorm over stem cells have left many American scientists frustrated and discouraged. Waiting in the wings with encouragement and cash is authoritarian Singapore, which has begun to earn a reputation as a haven for biomedical freedom.

The motive is economic. Faced with declining returns in electronics, the industry that vaulted Singapore into the ranks of the world's richest nations, Singapore in 2000 began an initiative in biotechnology.

"It was part of the overall strategy of diversifying the base of our economy and, more specifically, adding on a research-intensive sector," said Beh Swan Gin, who heads the Biomedical Sciences Group at the Economic Development Board.

Biotech joins a widening portfolio of industries Singapore is promoting. The nation is rapidly becoming a major center for private banking, for example, and it plans to build two of the world's most expensive casino resorts to rev up tourism.

Using the same combination of tax holidays and incentives that made it a base for the world's biggest electronics makers, Singapore has already managed to lure big drug companies. Factories pumping out pharmaceuticals for the likes of [Merck](#), [Pfizer](#) and [Schering-Plough](#) now generate roughly 18 billion Singapore dollars (\$11.4 billion) in annual revenue, and account for 5 percent of Singapore's economy.

But Singapore wants companies to do more than make drugs here. To persuade them to conduct basic drug research and development as well, Singapore offered to pay up to 30 percent of their building costs. At least 30 companies have responded, including the Swiss drug giant [Novartis](#), which has opened an institute here to develop drugs to fight tuberculosis and the dengue virus.

The centerpiece of Singapore's biotechnology effort is the Biopolis, a seven-building biomedical hive that opened in late 2003 at a cost of 500 million Singapore dollars. It is outfitted with the latest high-tech equipment and features a bar, a day care center and an underground facility made to house a quarter-million laboratory mice.

Authorities are now building a stem cell bank at Biopolis, which will be able to count on some of the world's most liberal laws on human embryonic cell usage.

Researchers hope that stem cells, the all-purpose building blocks that eventually turn into specific tissue like bone, muscle or nerves, can be harnessed and used to treat injuries or medical defects. Scientists have found that stem cells from embryos, unlike those in adults, have a greater flexibility and shelf life.

Bush administration opposition to stem cell research is based on the argument that it requires destroying embryos, each potentially representing a human life. Singapore allows stem cells to be taken from aborted fetuses or discarded embryos, and these embryos can be cloned and kept for up to 14 days to produce stem cells.

Singapore officials say they have spent 1.5 billion Singapore dollars (\$949 million) on biotechnology since 2000 and have budgeted another 1.44 billion Singapore dollars more over the next five years to finance development of new therapies and drugs.

That is not much compared with the approximately \$27 billion the [National Institutes of Health](#) spends each year. But it is spread among a much smaller crowd. While scientists working for government research institutions here say they are warned not to talk about money, they readily acknowledge that Singapore's salaries exceed those they can earn in the United States.

Lavish salaries and lofty titles have helped Singapore staff Biopolis with a roster of foreign luminaries. In 2001, the same year President Bush first imposed limits on financing of stem cell research, Singapore snagged the National Cancer Institute researcher Edison Liu Tak-Bun.

Dr. Liu said he had felt hemmed in by outdated academic structures and the biotechnology industry's preoccupation with financial survival.

"Singapore, however, welcomed new ideas and, because of its newness, provided degrees of organizational freedom necessary for me to succeed," Dr. Liu said in an e-mail interview. He now works at Biopolis as head of the Genome Institute.

In 2003, Singapore lured Jackie Y. Ying from the [Massachusetts Institute of Technology](#), where she had become its youngest tenured professor ever, to head up its Institute of Bioengineering and Nanotechnology at Biopolis.

Earlier this year, Singapore scored another pair of Americans, the dean of the [University of California](#), San Diego's school of medicine, Edward W. Holmes, and his wife, Judith L. Swain. Dr. Swain was the school's dean of translational medicine — the specialty of turning laboratory discoveries into practical drugs or therapies.

Although they will continue to work part of the time at the University of California, San Diego, Dr. Holmes gave up his \$450,000 dean's salary to become an executive deputy chairman at the Biomedical Research Council in Singapore. Dr. Swain will become executive director of a new organization, the Institute for

Clinical Sciences.

Singapore has not limited its poaching to the United States. The same year Dr. Liu came to Singapore, the Institute of Molecular and Cell Biology imported the cancer researcher Yoshiaki Ito, who at the age of 63 was facing forced retirement from Kyoto University in Japan.

In 2004, the British cancer expert Sir David P. Lane, renowned for his discovery of the p53 tumor-suppressing gene and for his warnings that financing shortages would lead to a British brain drain, announced that he, too, would move to Biopolis. He is now the executive director of Biopolis's cell biology institute.

Probably the best known of Singapore's imports was also one of its first — Alan Colman, who helped clone Dolly the sheep in 1996. Unable to find backers willing to wait for his research on diabetes to pay off, he found a ready investor in the Economic Development Board in Singapore, which helped finance ES Cell with a group of Australian investors.

“In Singapore, they want a return on investment in the long term,” said Dr. Colman, now ES Cell's chief executive. “That's why I came: I could get hold of the money to do the work in a commercial environment that I couldn't do in the U.S. or the U.K.”

Not all imports are scientific bigwigs, either. Amber Sawyer, 28, a post-doctoral fellow at the Institute of Molecular Cell Biology, came here this year with her husband, a sculptor. After meeting another institute import, an Australian stem-cell researcher, Simon Cool, last year, Dr. Sawyer said she was convinced Singapore was an ideal place to continue her research into using animal stem cells to grow bone.

ES Cell is hoping sales of its \$6,000-a-vial cell lines can help pay for the company's own research into finding stem cell treatments for diabetes and heart disease.

There is other evidence that Singapore's efforts to bolster home-grown discoveries are yielding results. It was Singapore doctors, for example, who in 2001 first succeeded in curing a young boy's congenital anemia by using stem cells from the umbilical cord of an unrelated child.

Last year, local scientists here demonstrated in experiments with mice that stem cells could enter the brain via the bloodstream rather than be introduced directly through an invasive procedure.

Researchers at Biopolis also recently published new findings on just how stem cells gain their ability to transform into other types of cells, a discovery that could help steer stem cells into specific treatments.

Not every foreign move into Singapore works out. A joint venture at Biopolis between [Johns Hopkins University](#) and Singapore's top scientific agency is closing down after the agency said Johns Hopkins was falling short of its recruitment goals.

But scientists say the addition of Dr. Copeland and Dr. Jenkins is a particular coup for Singapore — and an equally severe blow to the American research community.

“This is a sad, and I think for U.S. cancer patients, a tragic loss,” said Irving Weissman, director of the Institute for Stem Cell Biology and Regenerative Medicine at the Stanford School of Medicine in California.

Dr. Weissman's institute, along with the [Memorial Sloan-Kettering Cancer Center](#) in New York, had been ardently recruiting the two scientists, who were looking to find more secure financing for their work, which involves using mice to model human cancers.

“We have the biggest mouse colony in the United States,” said Dr. Copeland, “and it takes a lot of money to run that.”

The two were favoring Stanford, which stood to benefit from California Proposition 71 — the program meant to unleash \$3 billion in state financing for stem cell research. But legal challenges have kept that money in limbo.

Faced with the prospect of scraping for dwindling grants in an uncertain legal environment, the two scientists decided to follow the advice of their former National Cancer Institute colleagues, Mr. Liu and Mr. Ito, and move to the Biopolis.

Now, Dr. Copeland said, his biggest concern is not money for his mice, but how to get his cellar full of vintage wines halfway around the world from Maryland to tropical Singapore.

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