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U.S. CONGRESS

Would Cloning Ban Affect Stem Cells?

Prospects for research on "therapeutic" cloning dimmed substantially last week as the House of Representatives resoundingly passed a measure that would outlaw all human cloning, whether or not it was designed to produce a baby. Now it looks like the Senate may follow suit, thus robbing scientists of a chance to pursue a technology that some believe is vital to realize the promise of embryonic stem (ES) cell research but that others regard as too hypothetical to worry about right now.

Almost everyone is opposed to producing human babies via cloning. The House bill, sponsored by Dave Weldon (R–FL), stipulates a $1 million fine or up to 10 years in jail for anyone who produces or traffics in "an embryo produced by human cloning." This ban would prevent any scientist from trying therapeutic cloning, in which an embryo is created solely for research through a process called somatic cell nuclear transfer. In this process, genetic material from a body cell is inserted into an enucleated egg cell. Scientists say ES cells derived from patients' own DNA would provide them with a source of genetically matched tissues and avoid immune rejection. James Greenwood (R–PA) and Peter Deutsch (D–FL) proposed an amendment to the Weldon bill that would have allowed such research, but it was defeated 251–176.

Several scientists say a ban on therapeutic cloning would deliver a major blow to research on ES cells, which have the potential to develop into any cell type and thus might be used to treat diseases such as Parkinson's and diabetes. At a press conference before the House vote, Jordan Cohen, head of the Association of American Medical Colleges, warned that a sweeping cloning ban "would have grave implications for future advances in medical research and human healing." The procedure affords "the only way to make immunologically acceptable tissue" from ES cells, said Rudolf Jaenisch, a biologist at the Massachusetts Institute of Technology. Michael West, head of Advanced Cell Technology in Worcester, Massachusetts, says a ban "could set back critical research many years." The company has already announced plans to attempt to clone human embryos for ES cell research.

Other scientists say the technology is so untried, and there are so many other research lines to pursue, that a ban would not seriously wound the stem cell research endeavor, at least not for now. "Therapeutic cloning is not at the heart of the stem cell issue," says Steven Goldman of Cornell University, who does research with adult stem cells. Although "unfortunate," he says, "at this stage [a ban] wouldn't even slow progress in the field. We don't know enough to say [therapeutic clones] offer us options that other [technologies] wouldn't."

Even without a legal ban, the technology is simply not ready for a big rush into therapeutic cloning, says John Gearhart of Johns Hopkins University, who works with stem cells from fetal tissue. So far, "it's only been in the mouse that they've demonstrated they can clone an embryo and get embryonic stem cells."

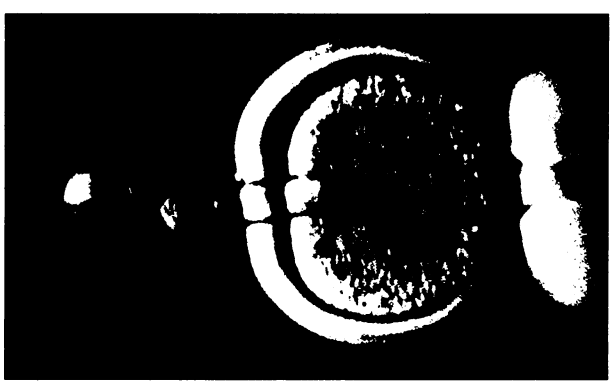
Gearhart also says that many scientists "feel there are ways of getting around [the rejection problem] without the nuclear transfer paradigm." Eventually there might be ways of altering cells to become "universal donors," he says. The recent National Institutes of Health report on stem cells (*Science*, 20 July, p. 413) says nothing about therapeutic cloning but suggests other possibilities including "banks" of stem cell lines.

Ultimately, scientists say, the purpose of therapeutic cloning would be to learn how the nucleus of a cell can be reprogrammed so that the cell reverts to its primitive, undifferentiated state. But many, including West, believe this knowledge might be gained by other means.

The Senate may be ready to outlaw all cloning, too. Majority leader Tom Daschle (D–SD) favors lifting the federal ban on funding ES cell research but said, "I'm very uncomfortable with even cloning for research purposes."

How this debate will affect the fortunes of ES cell research is as yet unclear. Some Republicans are clearly hoping that a fierce anti-cloning stand will exempt them from criticism for supporting ES cell research. But even an ardent fan of ES cell research, Senator Arlen Specter (R–PA), noted last week: "It's pretty hard to get [support for] stem cell research when people are equating it to cloning."

–CONSTANCE HOLDEN



CREDIT: JAMES KING-HOLMES/SPL/PHOTO RESEARCHERS

Forbidden? Microinjection techniques have enabled scientists to remove and insert nuclear material into ooctyes. If the U.S. Congress has its way, this cloning process will be banned in humans.

RUSSIAN SCIENCE

Academy Backs Off Cold War–Style Rules

MOSCOW—The Russian Academy of Sciences has quietly rescinded a controversial directive requiring its 55,000 researchers to report their foreign contacts to the RAS governing presidium. The rule, ostensibly to protect Russian intellectual property, has been replaced by one that simply seeks to help institute directors keep tabs on their more Western-oriented researchers. Watchdogs say that the new rule should calm the fears of scientists who saw a return to Soviet-style authoritarianism.

The existence of the directive, stamped "for internal use only," was first divulged in May by a human rights campaigner. The measure would have required researchers at the 357 RAS institutes to file reports on all international grant applications, articles sent for publication abroad, travel to international conferences, and foreign colleagues visiting Russian labs. The requirements prompted some top scientists to speculate that the directive was influenced heavily by the KGB's successor agency, the Federal Security Service (*Science*, 8 June, p. 1810). An RAS official says it is clear from the directive's wording that it was imposed by another government entity, which he declined to name. "It was recommended to the academy to put its foreign contacts in order," he says.

Last week, an academy spokesperson said the directive was not a major statement of policy and that the new rule is merely a "clarification." "It was just a reminder of how one

should organize his work with foreign colleagues, nothing more," says Igor Milovidov.

There is little doubt, however, that unflattering media attention also played a role. In June a presidium official told RAS institute chiefs at a closed meeting that the directive would be scrapped. That decision was made public last month, as most researchers were headed to their summer dachas. A notice in the academy's weekly newsletter, *Poisk*, revealed that the internal directive has been superseded by a seemingly benign measure requiring scientists to inform superiors in writing about their foreign activities.

Although the revision may end the controversy, some observers are discouraged by how few scientists bothered to complain about the original directive. Says microbiologist Garry Abelev of the RAS Center for Oncology in Moscow, "I expected that many more people would have protested."

–ANDREY ALLAKHVERDOV AND VLADIMIR POKROVSKY

Andrey Allakhverdov and Vladimir Pokrovsky are writers in Moscow.

EVOLUTIONARY BIOLOGY

A Molecular Approach To Mushroom Hunting

The oldest land plants just got a lot older. Generally considered to date back 450 million years, land plants may actually have been around 300 million years earlier, says S. Blair Hedges, an evolutionary biologist at Pennsylvania State University, University Park. Moreover, fungi and green algae could have evolved as much as 1 billion years ago, he and his colleagues report on page 1129.

Biologists have long wondered what the first terrestrial pioneers were and when they first drifted to shore. Many suspect that these land-lovers were fungi living in association with either green algae or cyanobacteria—the great, great, great ancestors of modern lichens and organisms called arbuscular mycorrhizae. The exact nature of these first plants, however, as well as when they arose, is unclear because there's scant fossil evidence earlier than 450 million years ago. So to nail down the origins of the first fungi and land plants, Hedges and his colleagues decided to take a molecular approach.

By searching through GenBank, they obtained sequences for 119 proteins from a wide variety of fungi, both aquatic and terrestrial. They compared the same protein from pairs of species; depending on the pairs, each comparison involved between five and 88 proteins. The fewer the sequence differences, the more closely related the species. Based on these calculations, they built a family tree and determined when the various fungal groups split off from one another.

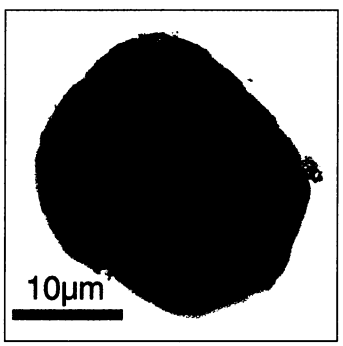
They were astounded. "We had no idea fungi evolved so early," Hedges recalls. "But we were finding these very old divergences." According to their analysis, most of the fungi branches split off between 1.5 billion and 966 million years ago—not 660 million to 370 million years ago, as previously reported. In particular, the Glomales order, which includes terrestrial fungi, took root about 1.3 billion years ago, suggesting that's when the first land plants came into existence.

Because the dates differ so radically from earlier analyses of either the fossil record or other DNA, "I expected [the paper] wouldn't get accepted," says Hedges. So the team members checked—and double-checked. They analyzed new species—a green alga, a moss, several higher plants, as well as a pathogenic and nonpathogenic yeast—to see where they landed along this new evolutionary timeline. These new data enabled them to place their fungal tree into a broader context and calculate divergence times for plants as well. The data confirmed their initial findings.

These new results "are surprising," agrees Linda Graham, a plant evolutionary biologist at the University of Wisconsin, Madison. Analyses of a ribosomal subunit gene from modern fungi had placed their origin just 600 million years ago. Furthermore, the oldest lichen fossils are a mere 400 million years old, while the most primitive mycorrhizae have been found in fossil fungi dating from 460 million years ago. As for higher land plants, the first fossils—represented by spores—are 520 million years old, although some biologists question whether the spores actually came from higher plants.

But Graham is nonetheless supportive. "This is probably the most complete study that I know of. They used several [proteins] and as many organisms as they could find data for," she explains.

This early origin is impressive, concurs Paul Strother, a paleobotanist at Boston College, who says that Hedges's results bolster a recent trend. "There's a 25-year history of people



Late bloomers. Fossilized spores, possibly from higher plants living 500 million years ago, are still much younger than the first terrestrial fungi.

CREDITS: (TOP TO BOTTOM) UNIVERSITY OF CHICAGO; PAUL K. STROTHER/BOSTON COLLEGE

ScienceScope

Women Wave Two years after admitting that its female researchers lacked administrative power, the Massachusetts Institute of Technology's top management is taking on a different look. This week the renowned Whitehead Institute announced that molecular biologist Susan Lindquist of the University of Chicago will take over as director when Gerald Fink steps down in October.

Lindquist, a member of the National Academy of Sciences who is known for her work in heat shock proteins and fruit flies, joins a growing coterie of women in senior administrative positions at MIT. In the past year alone, the institution has promoted or plans to promote women as associate chiefs of the cancer center, electrical engineering, and computer science; associate head of chemical engineering; director of the nuclear science lab; and associate provost. "This is an astounding amount of progress in a single year in terms of diversity in the leadership—particularly of science and engineering," says MIT biologist Nancy Hopkins, a key player in the 1999 report that focused on inequities among tenured women faculty members.

Stationary Target? In Washington, when things get tough, the tough assemble a blue-ribbon panel—ideally with Nobel Prize winners. That's what NASA hopes will smooth over White House and congressional concerns about the direction of the agency's financially troubled space station effort.

NASA and the White House sparred for months over the scope and membership of the panel, which was finally announced last week. Among the members are two Nobel laureates: physiologist Richard Roberts of New England Biolabs in Beverly, Massachusetts, and Robert Richardson, research vice provost at Cornell University. The 19-member team—the latest of a half-dozen to review the program over the past 15 years—will report by 1 November on how to fix management problems and a nearly $5 billion overrun.

According to sources close to the panel, NASA hopes the chair, retired aerospace executive Thomas Young, will bless the agency's current plans, while the White House trusts that the vice chair, Admiral Thomas Betterton, will press for more radical ways to control the spiraling costs.