

Cloning and Stem Cell Technology

Coping with a New Era

Amer S. Ahmed
Biochemistry 118Q
Stanford University

Opening A New Door

- Dolly -- The first mammal cloned from an adult's cells. Now mature, Dolly has given birth to a healthy lamb, Bonnie, the product of a normal mating and gestation.

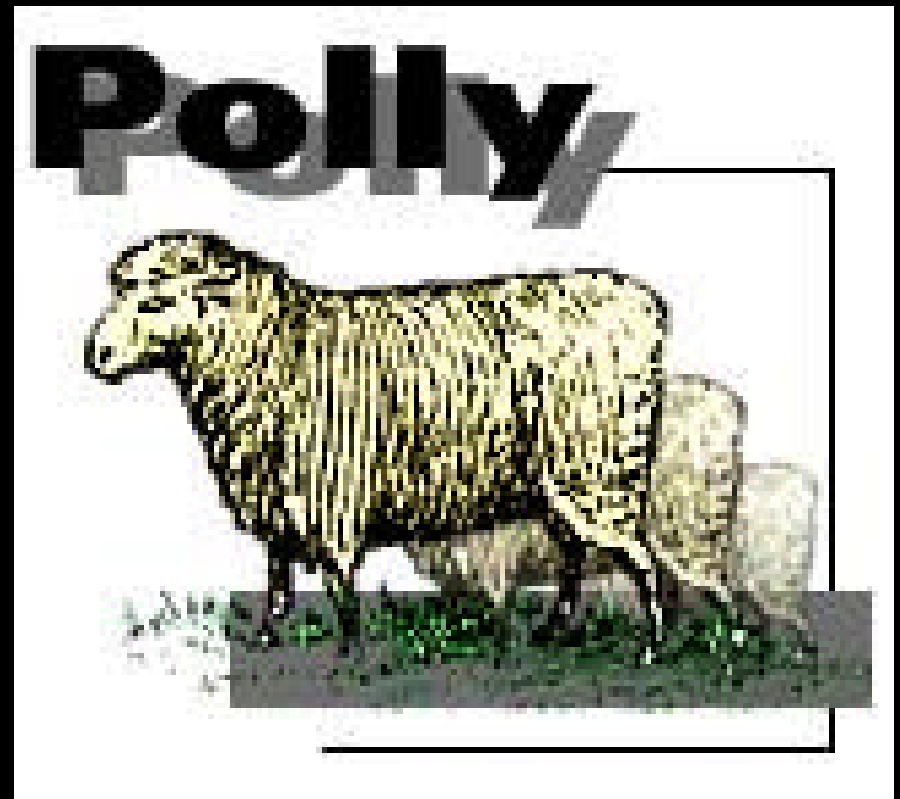


The Panic Reflex

- On March 4, 1997, President Clinton proposed a five year moratorium on federal and privately funded human cloning research or technology.
- This is in addition to a general ban on federal funding for research involving human embryos. The result? Only the few biotech firms willing to take a risk enter this research.

A Step Further

- Polly -- A transgenic sheep. Into her cells was incorporated human factor IX, a blood-clotting protein used to treat hemophilia B. The human protein is secreted into her milk. Significance? Cloning will make it possible to introduce precise genetic changes into any mammal and to create multiple individuals bearing the alteration. A new curative technology.

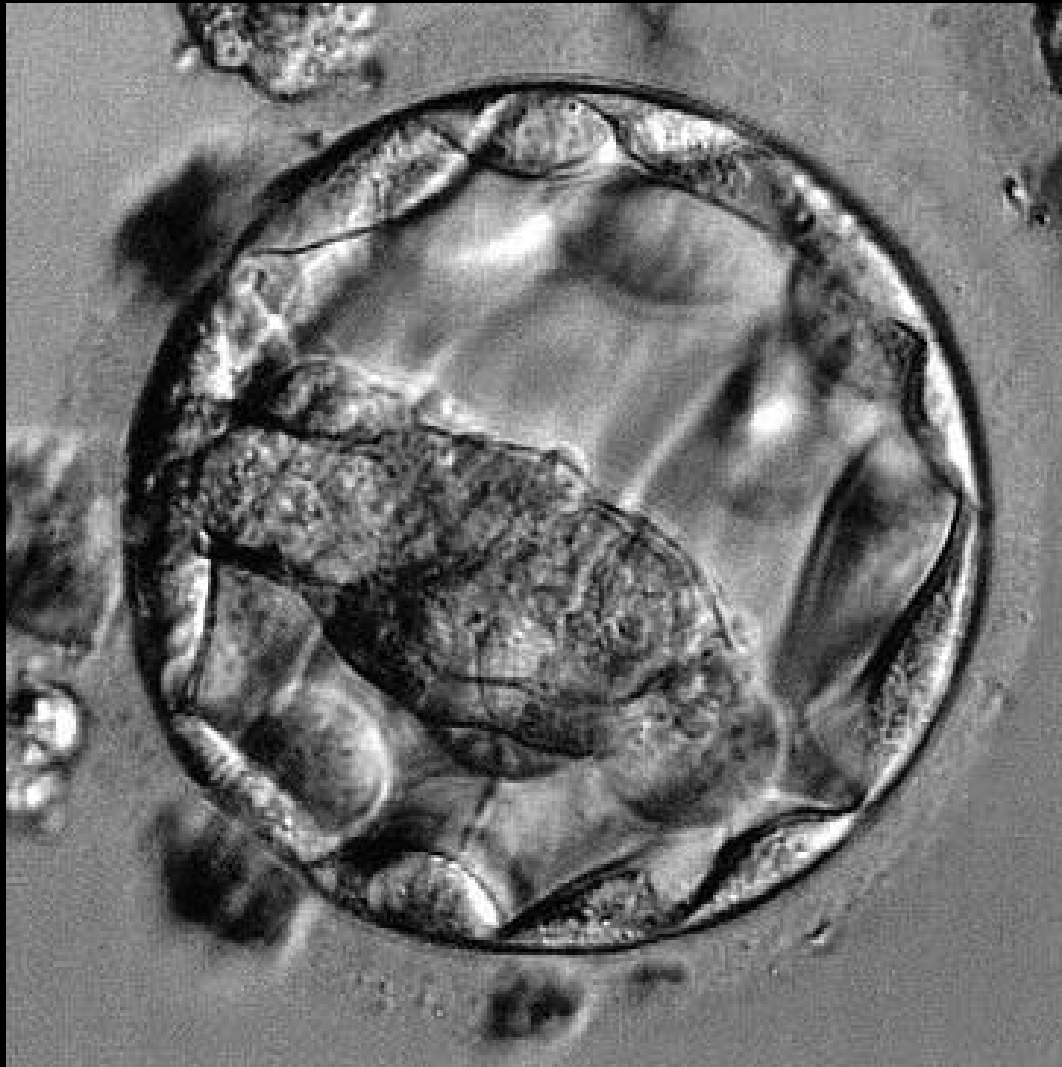


Why is this significant?

- Knowledge transfer. Relatively successful genetic research concerning mammals (sheep) provides valuable information that can be applied to humans.
- Specifically, the possibility of stem cell technology has become a reality.

Human Embryonic Stem Cells

- Blastocyst: Hollow ball of about 140 cells, which exits the Fallopian tubes to be implanted in the uterus. Clinging to the inside of this sphere are a group of identical cells--the ES cells--which are the starting point of the fetus. Soon they will be differentiated. For now, they are pure potential; holding the capacity to become any part of the body.



Applications of ES Cell Technology

Provided
sufficient
attention and
funding are
poured into the
field. —————→

- Cardiac Muscles to patch heart-attack victims.
- Neurons to mend paralysis.
- Brain tissue to treat Parkinson's disease.
- Pancreatic Cells to battle diabetes.

So what's the problem?

Thorny political, legal and ethical dilemmas.



Controversy scares away many researchers
and most biotech companies.

- NIH (funds most basic biomedical research) prevented from getting involved in this area by a ban on federal funding for human embryo manipulation.
- When only funding is private, researchers have no obligation and a reduced incentive to publish their work (preferring instead to submit it directly to the Patent Office).
- Research doesn't get discussed at major scientific meetings; nor does it get the kind of ethical review that is given to publicly funded efforts.

Two-pronged Consequences



- Scientists, researchers, and biotech firms are dissuaded from developing the area of ES technology because of a lack of monetary support or incentive, and legal-political censure.
- People are forced to evade the law and continue their research behind the closed doors of a laboratory, where no checks or safeguards can be effectively implemented.

Solutions anyone?

- The hasty ban on human research involving human embryos needs to be overturned, bringing federal funding to this area, along with the concomitant oversight and safeguards.
- Instead, more comprehensive legislature concerning cloning and ES technology.
- Different Classes and Levels of Containment.

Cells → Tissues → Organs → Organisms

A diverse advisory board to examine consequences and benefits (if any) of research or development in each.
Accept or deny support for individual experiments.



Exemplary initiative

Ethics advisory board consisting of:

- An ethicist
- A Methodist minister
- A Futurist
- A Theologian
- A Judaic scholar
- An Islamic expert

Help analyze and stave off public opposition to this controversial research. Confront common fears and provide facts (through statements) about technology.



AFP PHOTO

Opposition and Common Concerns

- Embryonic Stem Cells are found only in embryos or very immature fetuses. *Pro-life forces* have targeted firms which research this area, hoping to stop the science cold. BUT at the blastocyst, there is no nervous system No means of feeling pain or sensing the environment. Embryo does not become a sentient being till later development. U.K. Human Genetics Advisory Commission shares this view and has initiated a public awareness campaign.
- A clone would not be a normal human.

- An unconscious clone could be produced to supply organisms.
- A clone will have the same feelings and emotions as its genetic parents.
- A clone will not have a soul.
- Cloning is ‘playing God.’