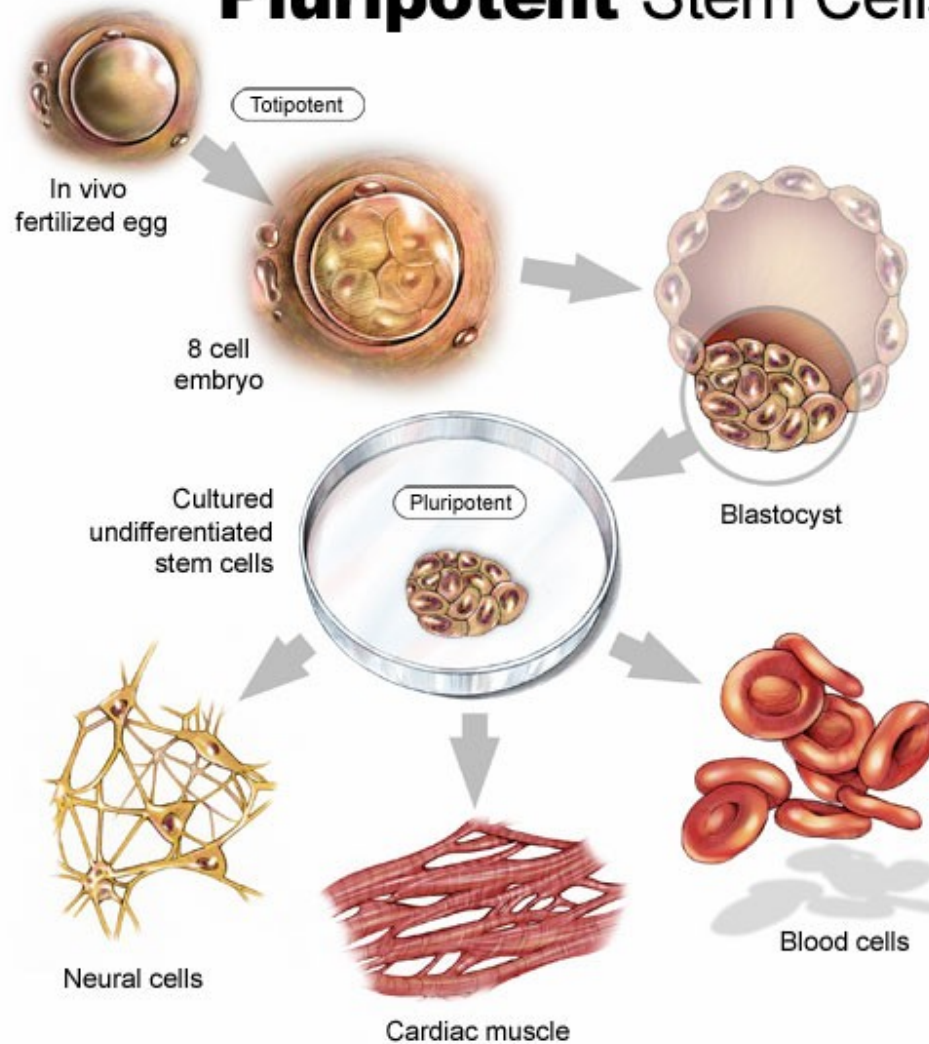


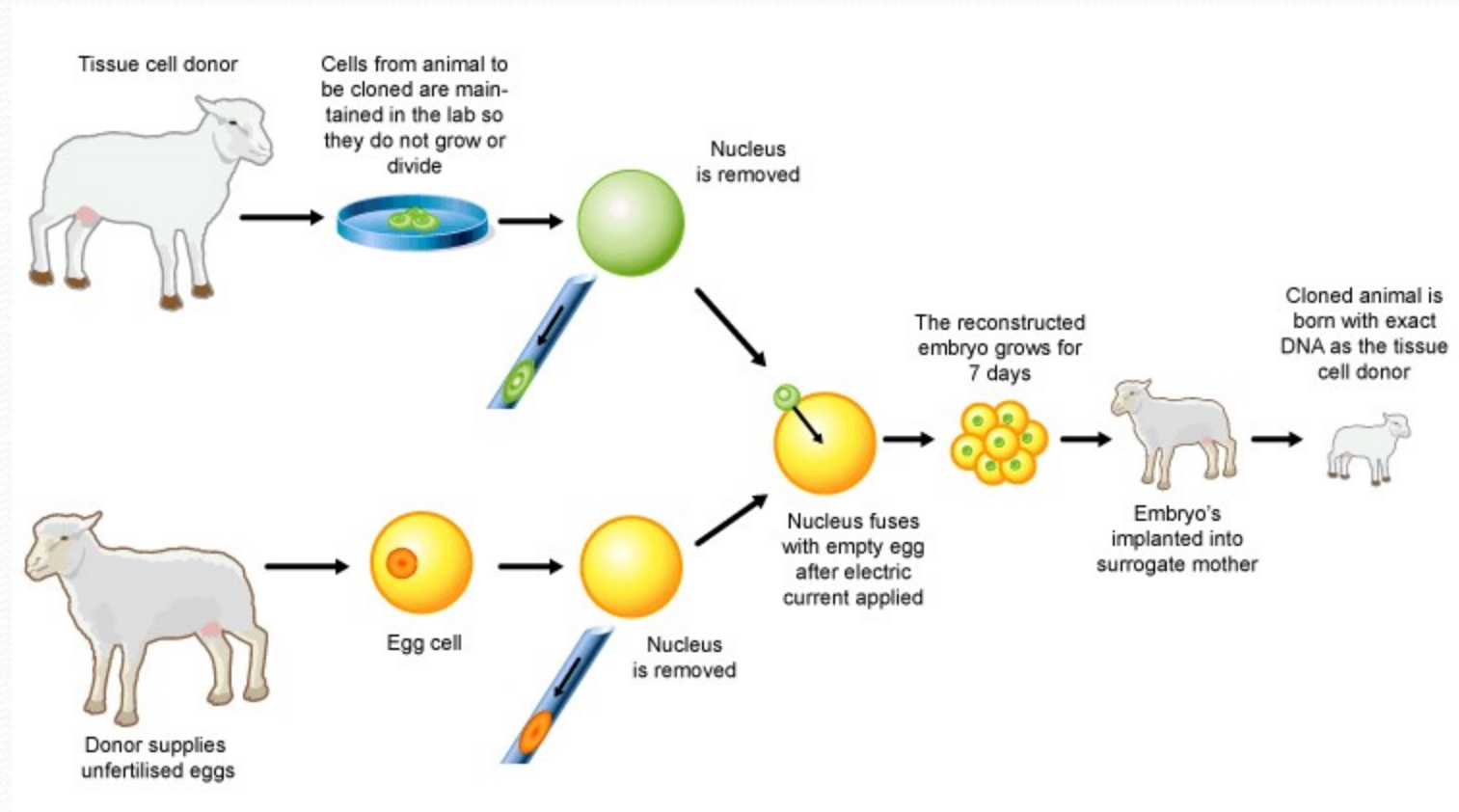
# The Ethics and Costs of Embryonic Stem Cells: Assessing Proposition 71

Solomon Lee

# Pluripotent Stem Cells



# ESC Therapy and Cloning





# The Benefits of ESC

- Embryonic stem cells could conceivably address...

“Parkinson’s disease, spinal cord injury, stroke, type 1 diabetes, heart disease, rheumatoid arthritis, osteoarthritis, kidney disease, blood diseases (including sickle cell anemia), blindness, muscular dystrophy, liver disease, loss of teeth, and baldness”  
(The Century Foundation Guide to the Issues 14)



# Proposition 71

- California Stem Cell Research and Cures Initiative (California Constitution Article XXXV)
- Passed November 2, 2004
- Stem cell research as a constitutional right
- \$3 billion dollars allocated over 10 years
  - California Institute of Regenerative Medicine (CIRM) to oversee implementation of Proposition 71
  - Independent Citizen's Oversight Committee (ICOC) to oversee CIRM



# Ethical Problems

## Issues with ESC

- Should embryos be considered human?
  - Embryos as Products - The exploitation of embryos as an experimental resource
  - Equality and Justice – Destroying of lives for the protection of others



THE SONG OF A BLASTOCYST.  
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- Potential for Human Cloning
  - Mass production of cloned embryos with perfected somatic cell nuclear transfer
  - Any implanted cloned embryo will grow into a full developed human



# Issues with Human Cloning

- Imminent and Projected Dilemmas
  - Production of cloned children
  - Offspring with two male or two female genetic parents
  - Implantation of human embryos into animal wombs
  - Hybrid embryos combining animal and human gametes
  - Growing parental control over the offspring genetics







## • Degradation of Human Procreation and Human Family

- Pregnancy as a research technique
- Losing distinction between human and non-human
- Producing children without normal familial bonds

# Logistical Problems

- Uncertainty of Results
  - Questionable reliability and consistency of stem cells
  - Extremely long and costly drug development time







- Flocking of scientific talent to California
  - Loss of stem cell researchers from other states
- Minimal safeguard against self-interested decision making
- \$3 billion budget
  - Over-allocation of money leads to inefficiencies

# International Policy

- United Nations General Assembly Logjam
  - Costa Rica - Ban all human cloning regardless of whether the cloned embryos are implanted or destroyed as embryonic stem cells
  - Belgium – Ban only the implantation of cloned embryos while allowing the creation and destruction of cloned embryos for research

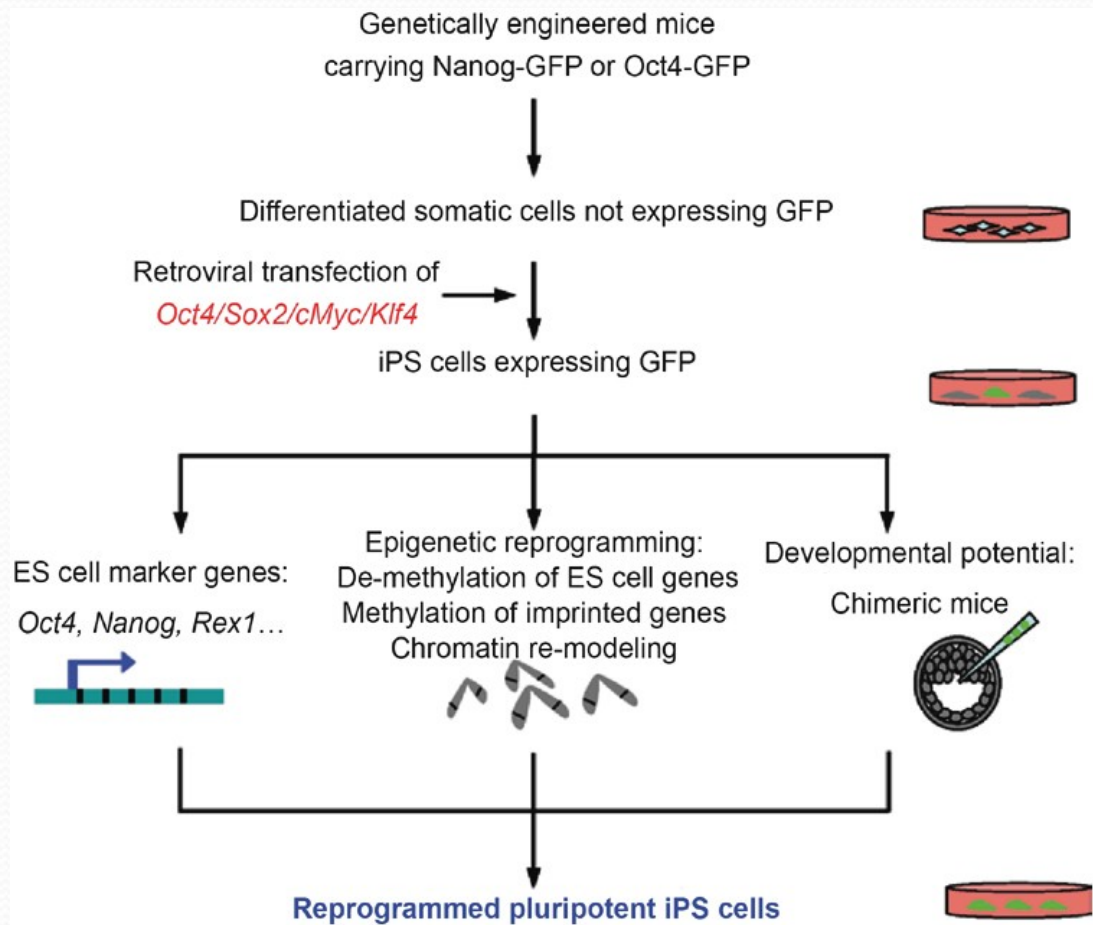




# Latest Breakthroughs

**Table 1. Comparison of the Five Factors in the Phenotype of Loss-of-Function and Gain-of-Function Experiments**

	Knockout ES Cells	Knockout Embryos	Overexpression in ES Cells
<i>Oct-3/4</i>	Cannot be established	No epiblast	Induces differentiation
	Niwa et al., 2000	Nichols et al., 1998	Niwa et al., 2000
<i>Sox2</i>	Cannot be established	No epiblast	Does not induce differentiation
	Masui et al., 2007	Avilion et al., 2003	Does not induce LIF independency
			M. Nakagawa and S.Y., unpublished data
<i>c-Myc</i>	Can be established	Normal epiblast	Does not induce differentiation
	Normal self-renewal		Induces LIF independency
	Davis et al., 1993	Davis et al., 1993	Cartwright et al., 2005
<i>KLF4</i>	Not reported	Normal epiblast	Does not induce differentiation
		Katz et al., 2002	Induces LIF independency
			Y. Tokuzawa, M. Nakagawa, and S.Y., unpublished data
<i>Nanog</i>	Can be established	No epiblast	Does not induce differentiation
	Spontaneous differentiation		Induces LIF independency
	Mitsui et al., 2003	Mitsui et al., 2003	Chambers et al., 2003; Mitsui et al., 2003

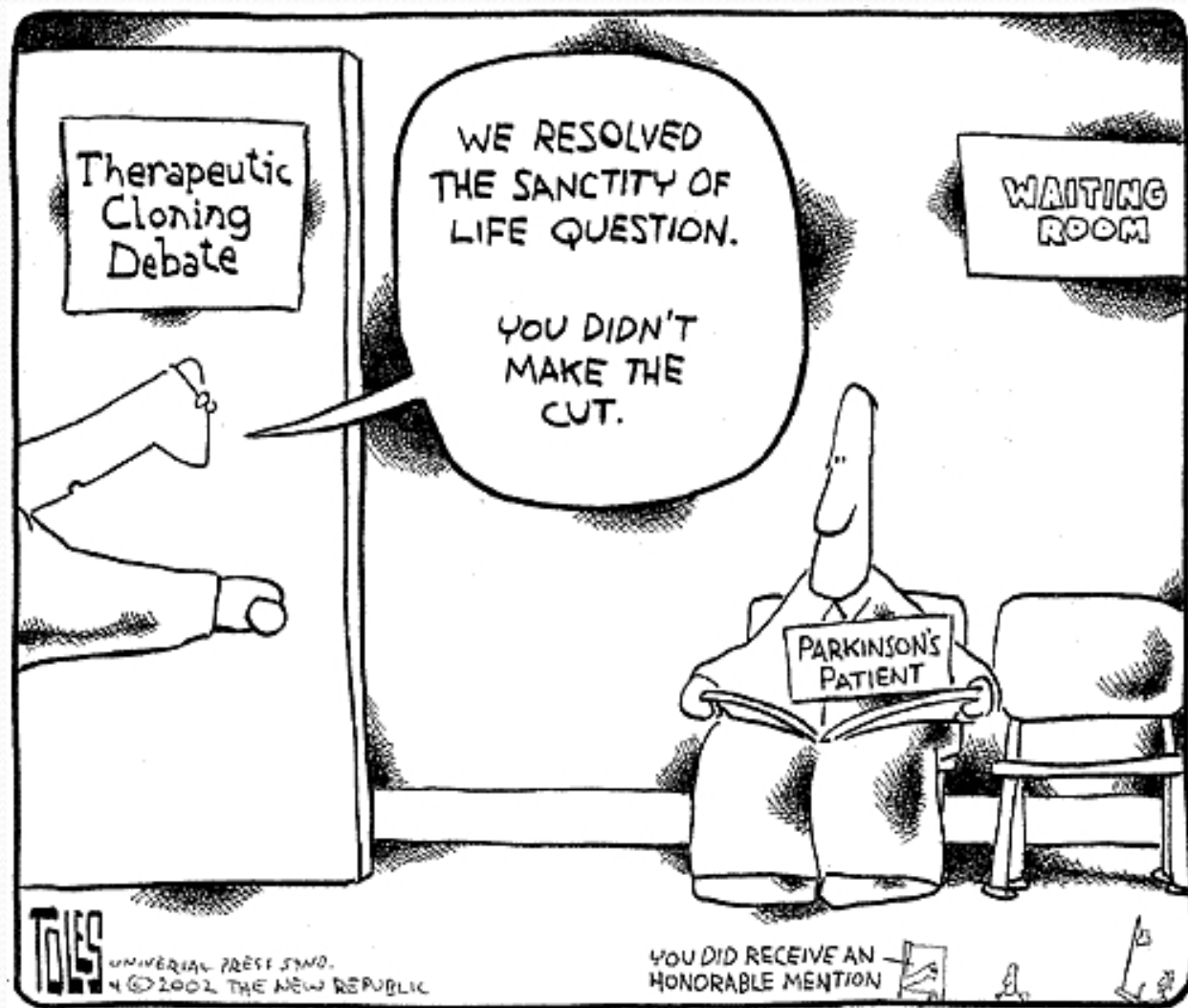




# Ethical Implications

- Moral issues resolved
  - No embryos created or destroyed
  - No chance of human cloning without embryos
- Logistical issues of costs, benefits, efficiency, and equity need still be considered





TNR 4-200



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