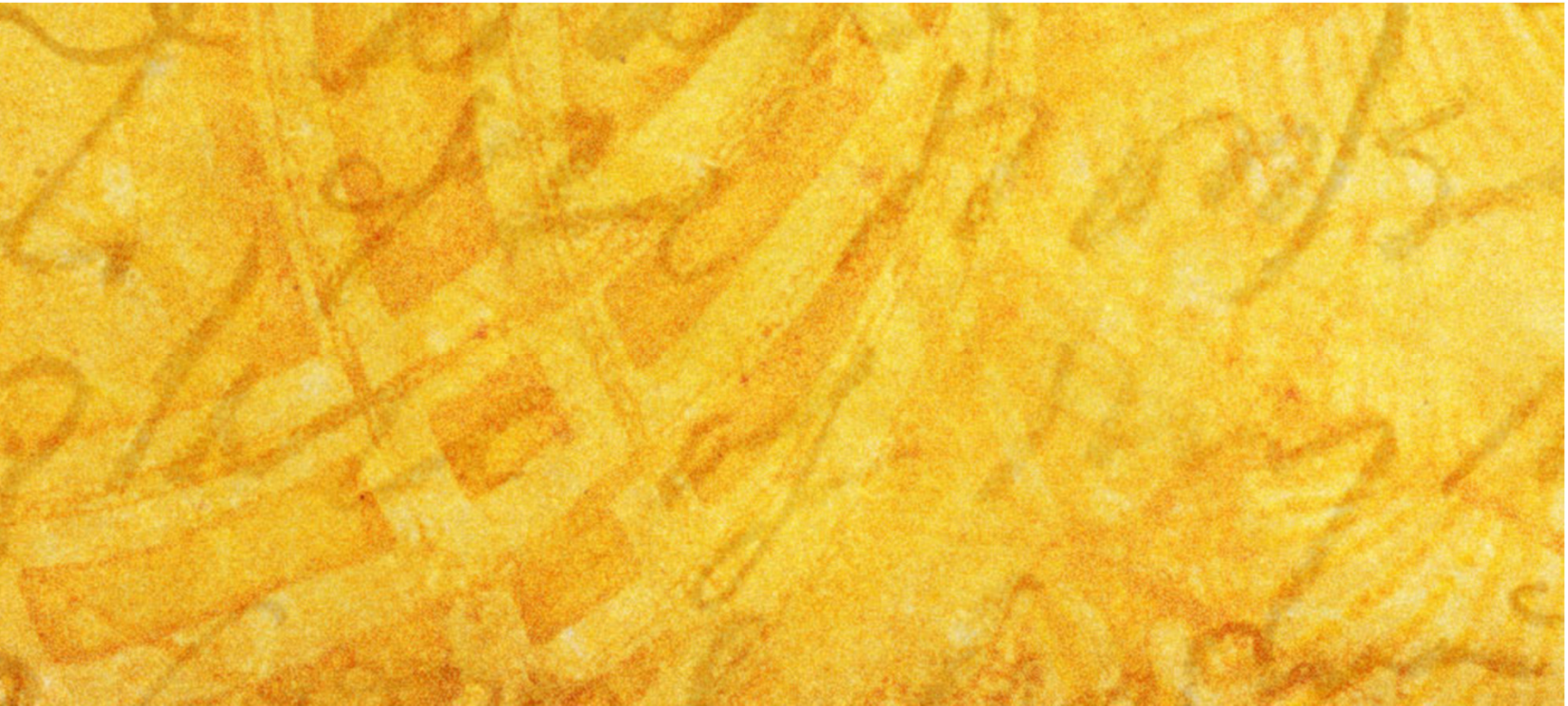




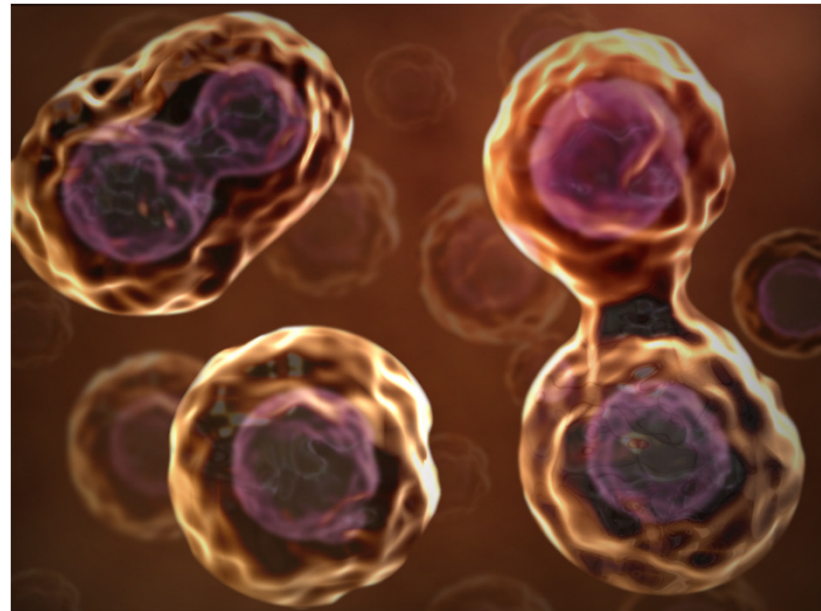
# 17.2: Applications of the Cell Cycle

Biology 30



# Cloning

- Cloning is the process of forming genetically identical offspring from a single cell or tissue.
  - i.e., asexual reproduction or identical twins



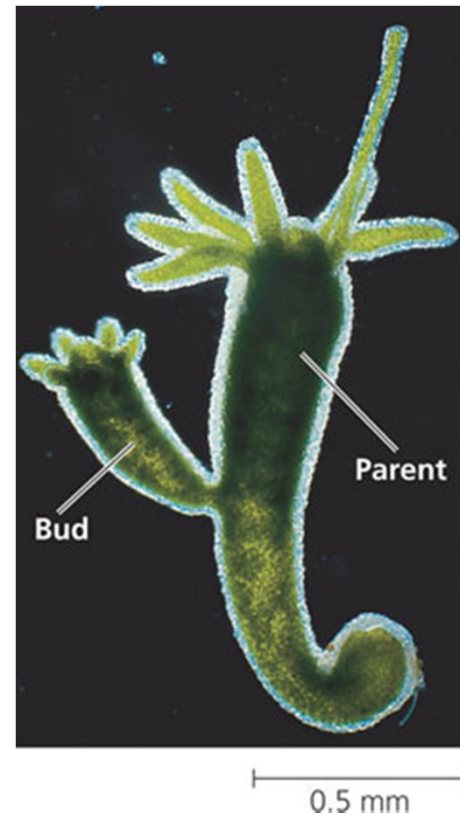
# Types of Cloning:

- Strawberries – runners = clones of parent plant



## Hydra – budding

- reproduce asexually by budding. The bud break off to form genetically identical organisms.

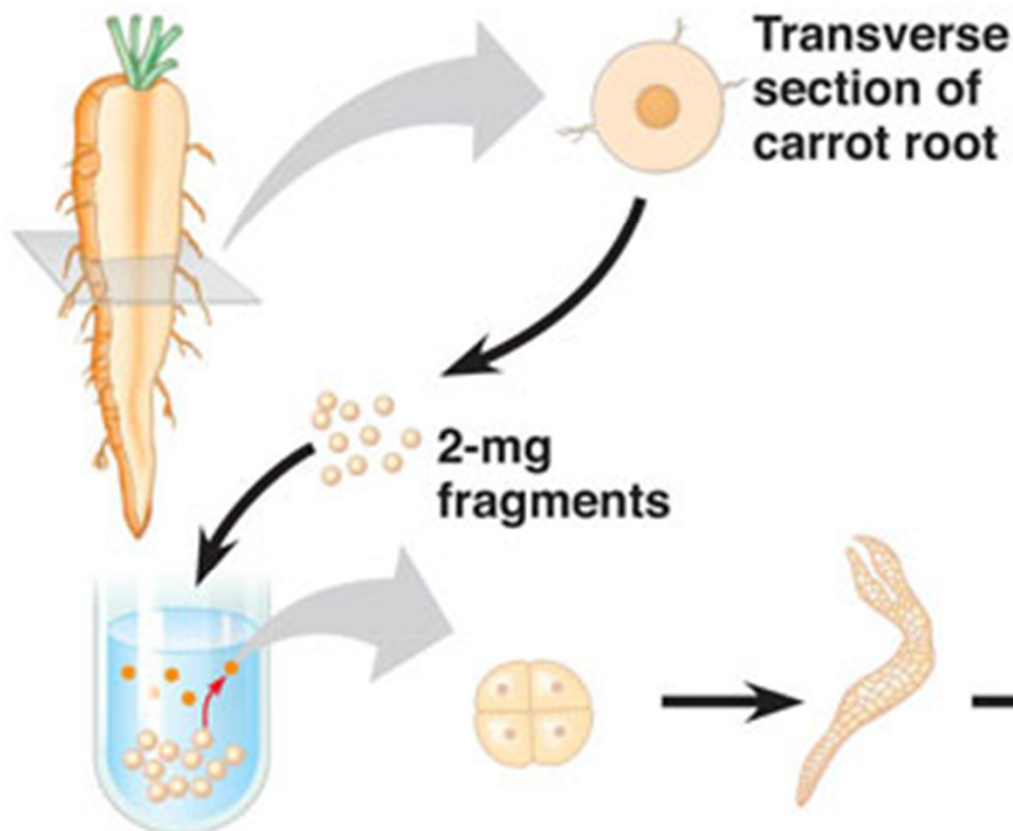


## Fredrick Stewart – Carrots (cloning) [late 50's]

- any carrot cell can be used to clone another carrot
- cells of a carrot remain unspecialized
- trick – how do we delay specialization or differentiation processes that occur in cells?



## EXPERIMENT



## RESULTS



Fragments were cultured in nutrient medium; stirring caused single cells to shear off into the liquid.

Single cells free in suspension began to divide.

Embryonic plant developed from a cultured single cell.

Plantlet was cultured on agar medium. Later it was planted in soil.

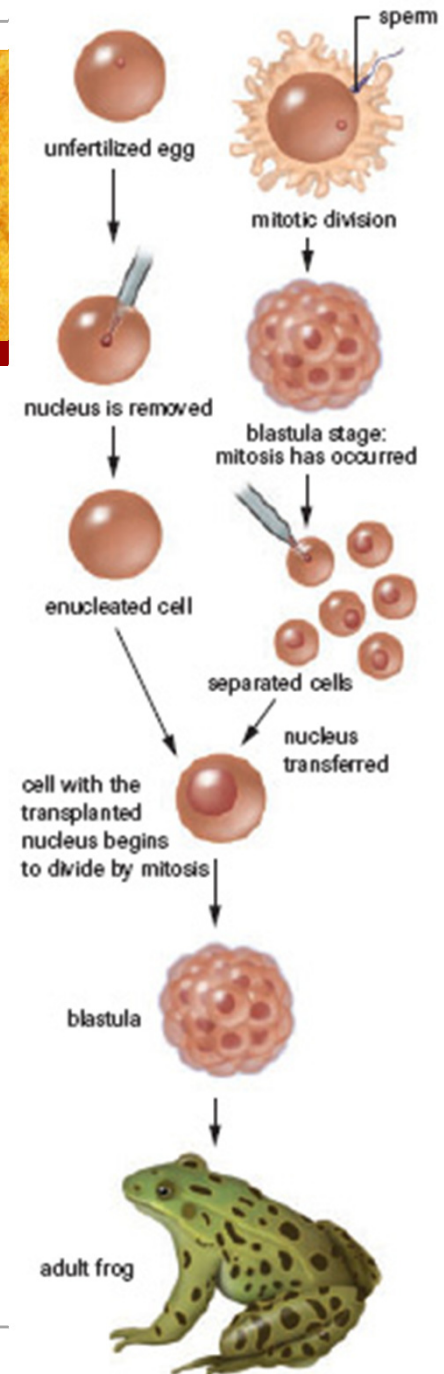
A single somatic carrot cell developed into a mature carrot plant.

# Robert Brigs & Thomas King

- pioneers in animal cloning
- nuclear transplant in frogs

## steps:

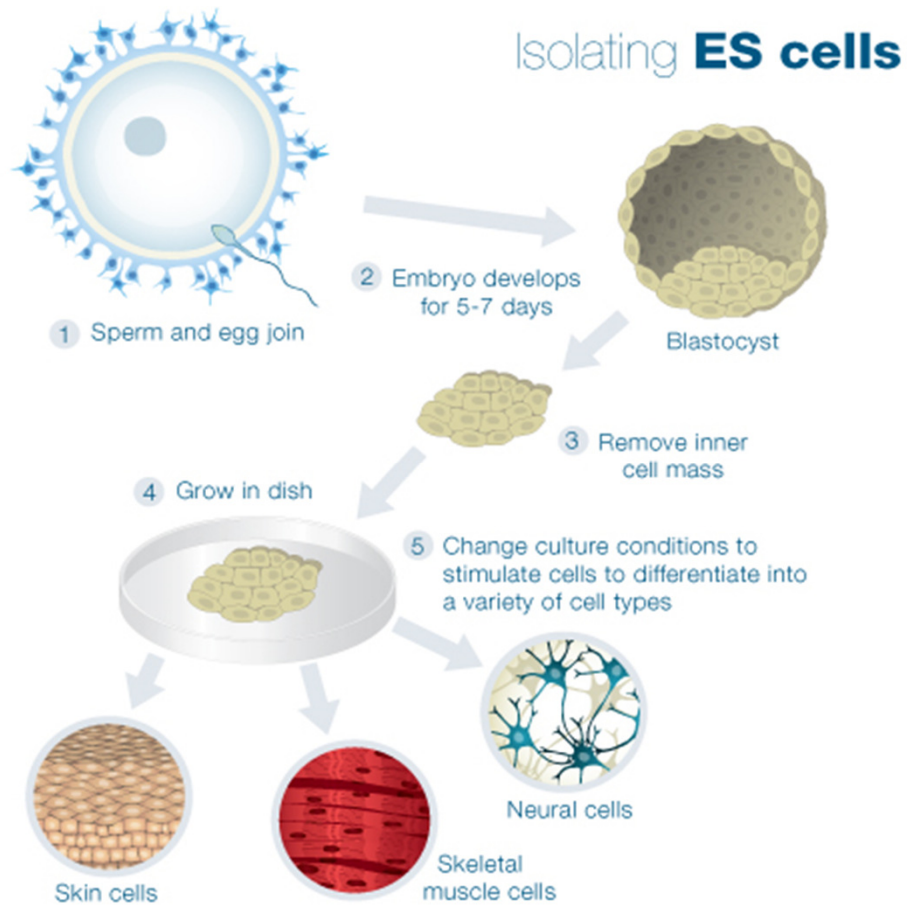
- extracted a nucleus from an unfertilized egg cell (*enucleation*)
- next they extracted a nucleus of a frog cell in the blastocyst stage
- inserted this nucleus into the enucleated egg cell.



- 
- Totipotent: any nucleus that is able to bring a cell from egg to adult (i.e., Morula cells)







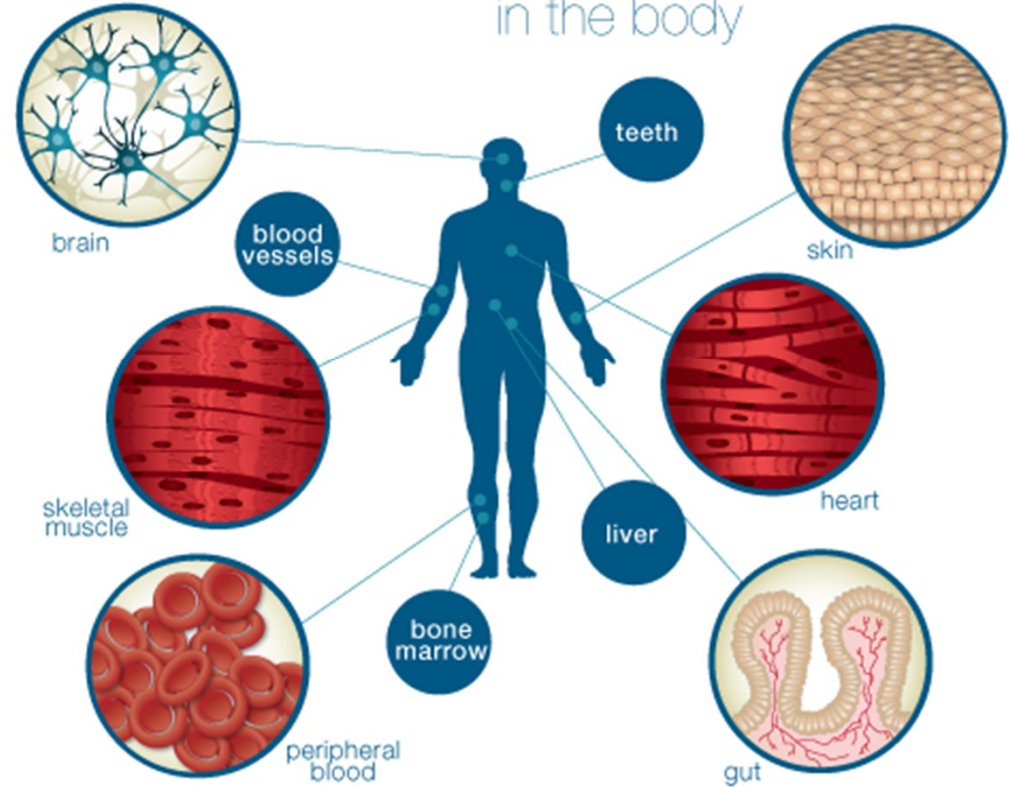
Pluripotent: Can become almost any type of cell (i.e., blastocyst, fetus)



Multipotent: Can become a limited range of cells (i.e., umbilical cord, adult bone marrow, etc)



### Locations of **Somatic Stem Cells** in the body

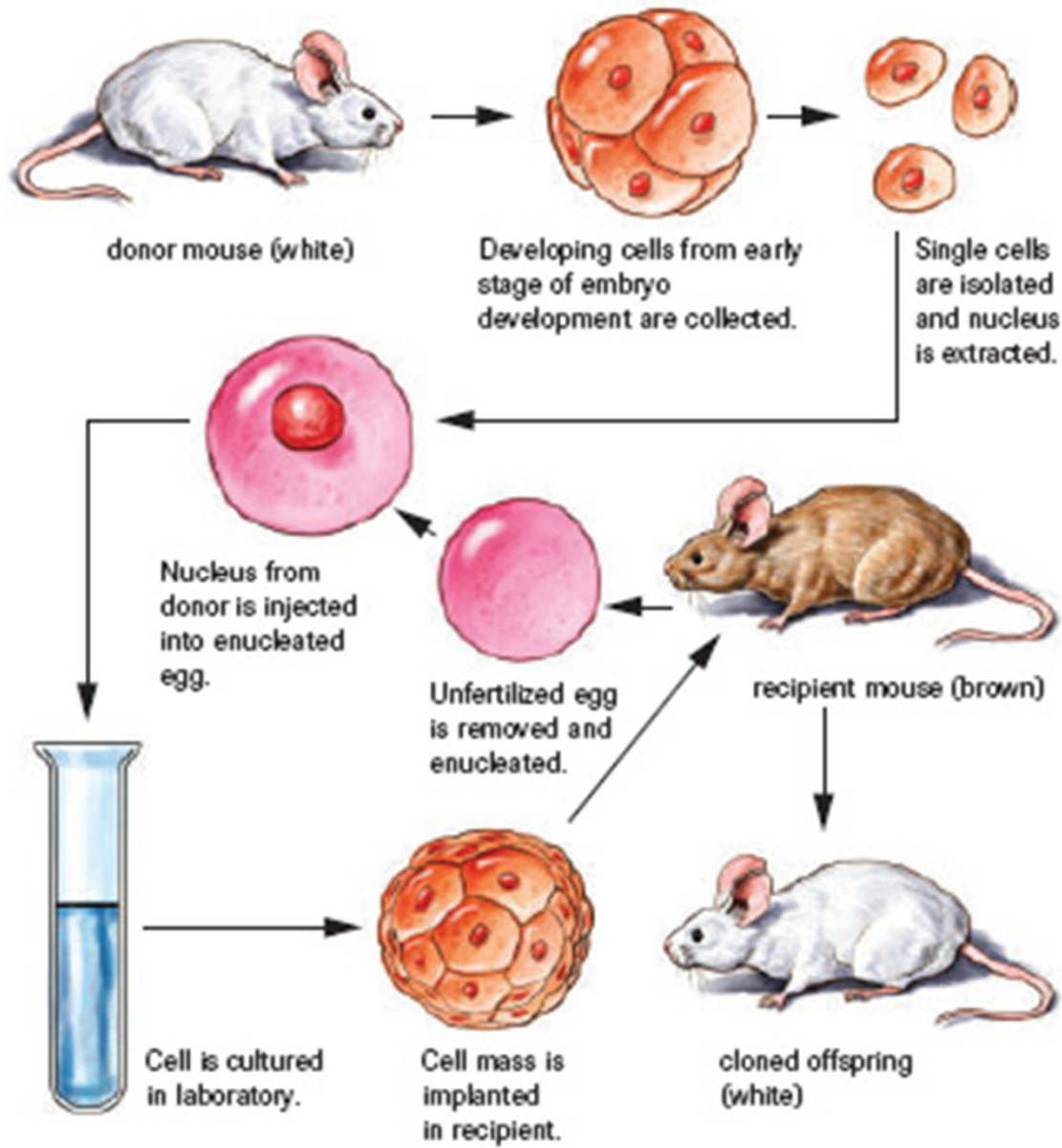


# Unlocking Stem Cells Potential

- <http://learn.genetics.utah.edu/content/tech/stemcells/scfuture/>

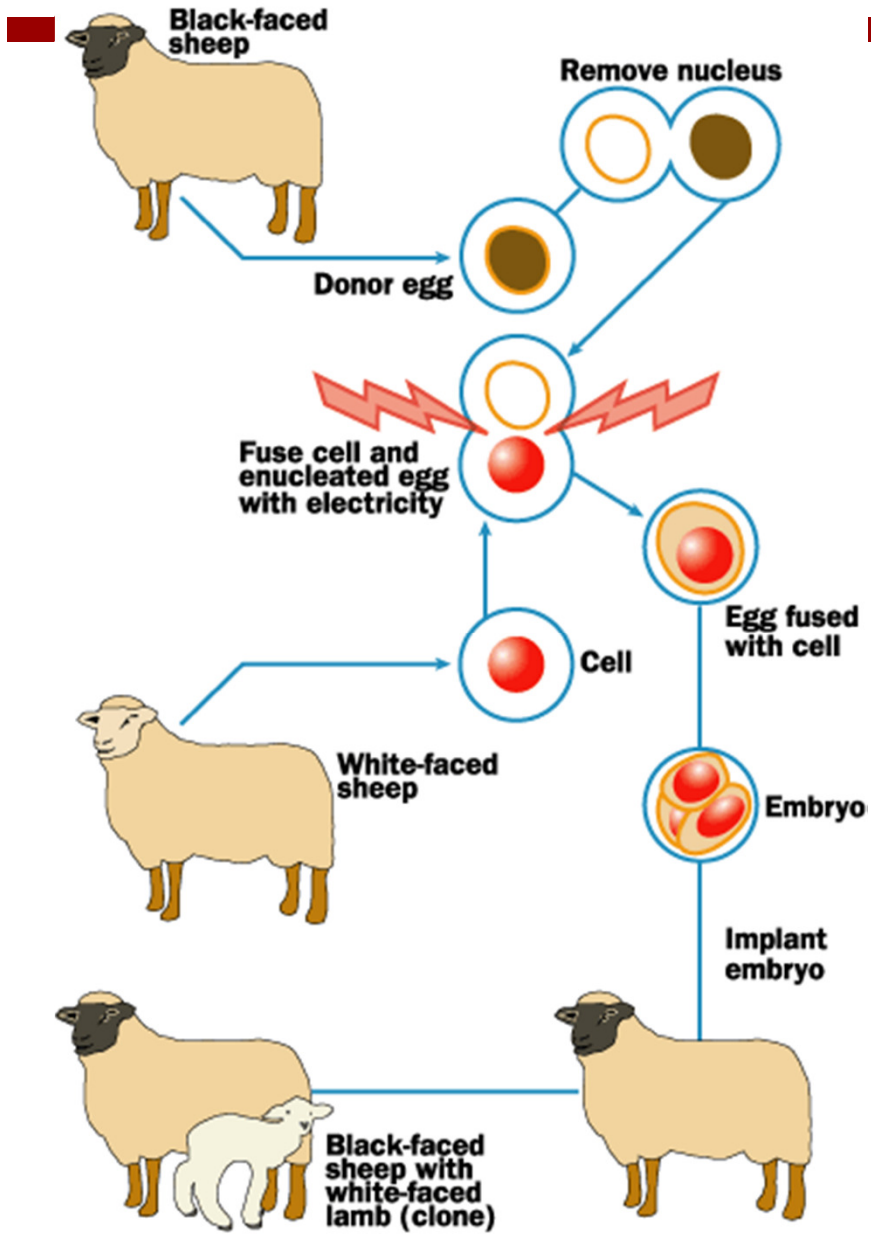
# Cloning Mammals:

- mammal cells are not totipotent, morula cells are
- in humans – identical twins (monozygotic)
- Identical twin formation



# Dolly the Sheep

- nucleus of a cell from an adult sheep was inserted into an egg cell of another cell that had been enucleated (nucleus removed)
- Then, stimulated with electricity to start cell division
- at the blastocyst stage, its implanted into a surrogate



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# Problems with Dolly

You don't need to write this down....

- Despite a life expectancy of 11 to 12 years, Dolly only lived to be six years old. She died of progressive lung disease and severe arthritis, and lung cancer was discovered after an autopsy.
- Some have speculated that a contributing factor to Dolly's death was that she could have been born with a genetic age of six years, the same age as the sheep from which she was cloned. One basis for this idea was the finding that Dolly's telomeres were short, which is typically a result of the aging process.

[http://en.wikipedia.org/wiki/Dolly\\_\(sheep\)](http://en.wikipedia.org/wiki/Dolly_(sheep))

See pg. 570 in text



# Nova Video – Stem Cells

- Click on the link below to watch the video
- [Stem Cells: Early Research](#)
- <http://www.vimeo.com/14685597>



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# Cancer

- Cancerous cells are regular cells that have a decreased interphase
  - What are the ramifications of a short interphase? Why is it problematic?
- More to come on specific cause of cancer in the DNA section of this unit

# Read: The Ethics of Stem Cell Research

- **Read section 17.2 in textbook pg. 565-571**
  - Explore an issue box on page 569 (Do not do the research assignment, just read the info)
- **Case Study: “Stem Cells: Promises to Keep?”**
  - Ethical questions – make sure you explain yourself fully and make reference to your scientific knowledge from Bio 30.