

Biotechnology: Status and Uses

Animal Science 434
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Reproductive Biotechnology's

- Artificial insemination
- In vitro embryo production
- In vivo embryo production
- Embryo transfer
- Gender selection
- Stem Cells
- Genetic engineering
- Cloning

In Vitro Production of Embryos

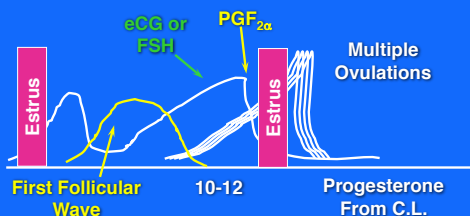
- Oocyte isolation and maturation
- Sperm preparation
- Sperm capacitation
- Fertilization
- Embryo Development

As a direct result of research conducted by Parrish, Susko-Parrish, First, Leibfried-Rutledge, Critser and Ax, more than 450,000 IVP embryos are produced world wide each year and the procedures are the among the most cited publications in all of reproductive physiology!

In Vivo Embryo Production

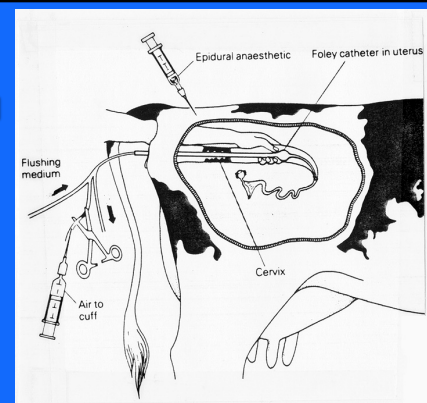
- Normal cycling female
 - horses
- Superovulated female
 - Cattle
 - Sheep
 - Goats
 - Deer
 - Humans

Stimulating Follicular Development



Non-Surgical Embryo Flush

Day 6 or 7



Stage of Embryo at Recovery

Tight Morula (day 5 - 7)



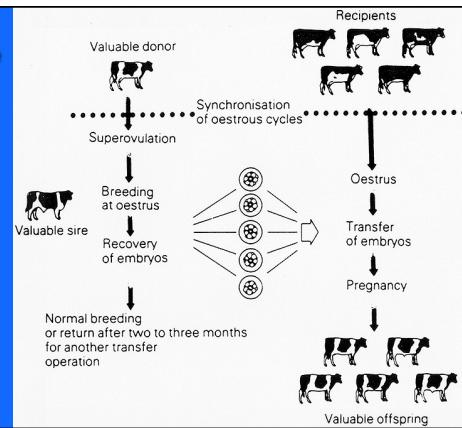
Early Blastocyst (day 7 - 8)



Blastocyst (day 7 - 9)



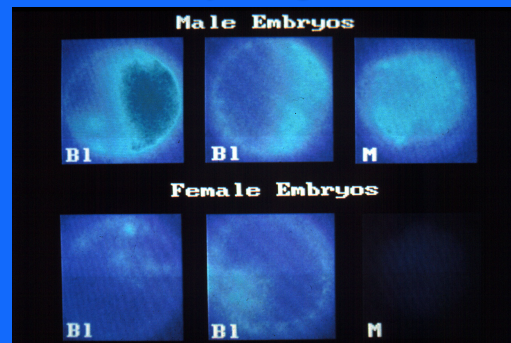
ET - Scheme



Embryo Sexing

- Hy Antigen
 - Associated with male cells
- PCR and Detection of Y and X DNA

Hy-Antigen

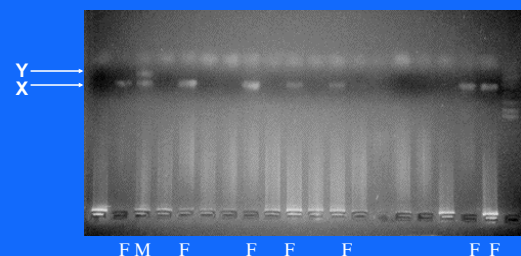


Octopus Springs - Yellowstone National Park



Home of *Thermus aquaticus* - Taq Polymerase

PCR Approach to Embryo Sexing



Sperm Gender Selection

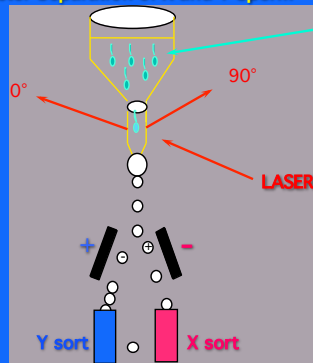
Selection of X or Y sperm

PERCENT DNA DIFFERENCES BETWEEN X and Y CHROMOSOME

Human	2.9
Cattle	3.8
Chinchilla	7.5
Turkey	0

X Chromosome has more DNA!!!

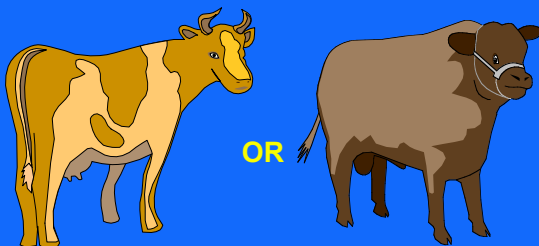
Flow Cytometer Separation of X and Y Sperm



Sperm Gender Selection

- Flow Cytometry
 - Only method that works!
 - Very few sperm recovered
 - Reduced fertility
 - Expense will limit use

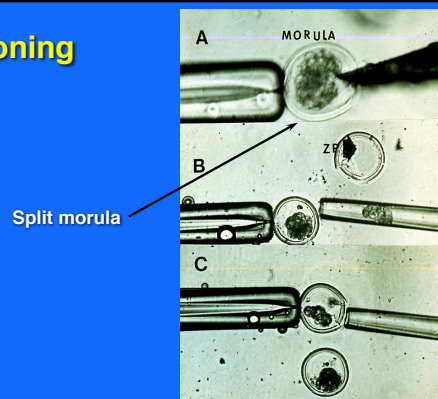
Fetal Sexing

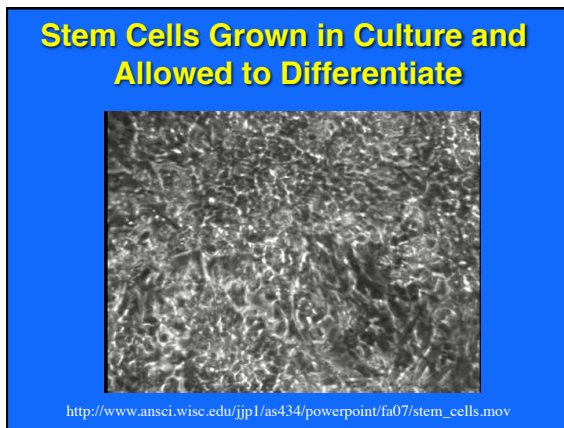
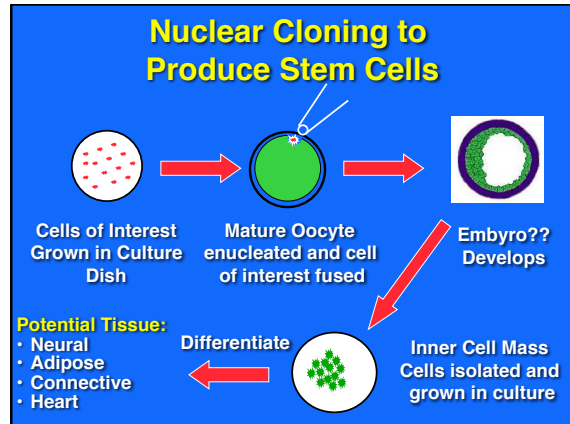
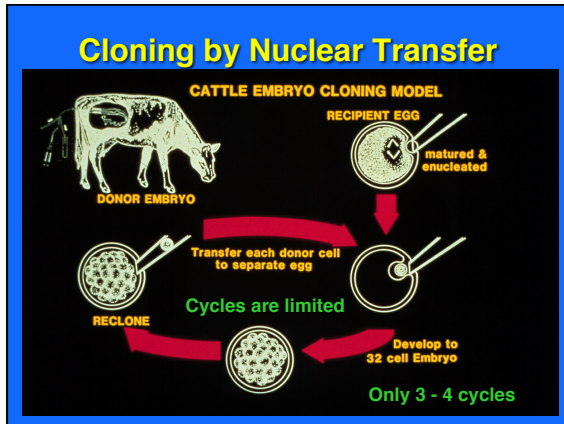


Ultrasound Evaluation

• Day 55 - 65

Cloning



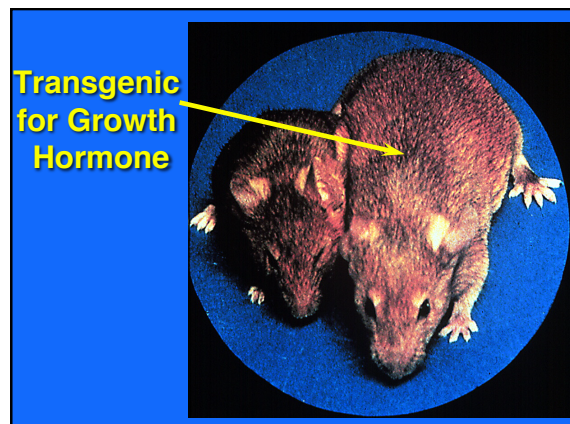
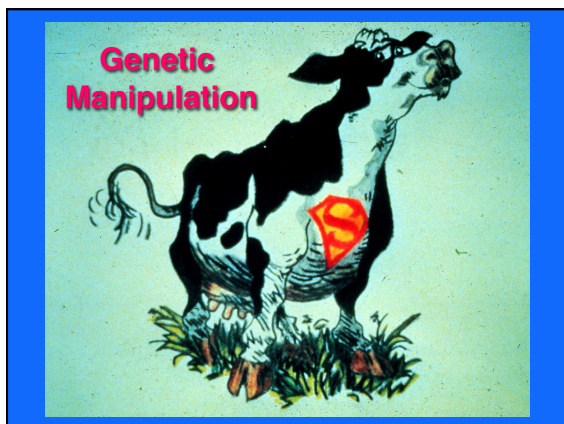


Benefits of Stem Cell Research

1. Regenerative medicine and tissue engineering

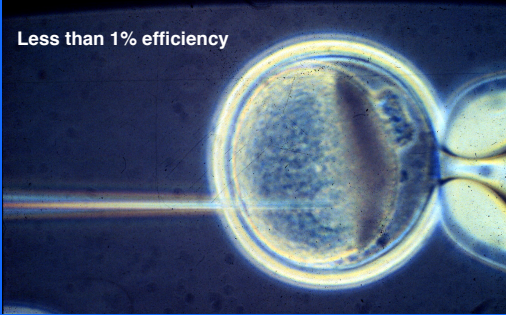
In vitro systems: drug discovery, toxicology, diagnostic assays and cell culture reagents

Biomedical research: unravel mechanisms of disease and human development

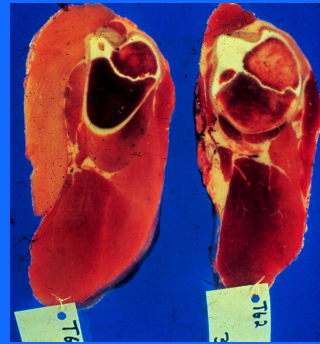


Gene Transfer Using Micro- Injection of Pronuclei

Less than 1% efficiency



Gene Transfer Using Viral Transfection



Better success but left with potential for viral replication