

50 Years of Applying Reproductive Technology for Cattle

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Reproductive Management 1900-1950

- ◆ Buy a neighbor's bull
- ◆ Superior phenotype
- ◆ Limited genetic information
- ◆ Breeding season

Reproductive Management 2000-2011

- ◆ Buy a neighbor's bull
- ◆ Superior phenotype
- ◆ Likely genetically superior
- ◆ Breeding season

Why add reproductive technology?

Priorities

1. Get the cow pregnant
2. Genetic improvement
3. Convenience / efficiency
4. Try new approaches

Foundation for Success

- ◆ Management
- ◆ Nutrition
- ◆ Herd health
- ◆ Usually crossbreeding

Before 1950

- ◆ No frozen semen
- ◆ No disposables
- ◆ No EPDs
- ◆ No estrus synchronization
- ◆ No embryo transfer
- ◆ Minimal vaccination

Routine Tools

1. AI
2. Electroejaculation
3. Vaccination
4. Frozen semen
5. Body condition scoring

Routine Tools

6. Hormones
 - Progesterone
 - Prostaglandin
 - GnRH
7. EPDs
8. Ultrasound
9. Sexing sperm, fetus
10. Genomics

Niche/Research Tools

1. Hormone assays
2. Superovulation
3. Nonsurgical embryo recovery & transfer
4. Freezing embryos
5. In vitro fertilization

Niche/Research Tools

6. Splitting embryos
7. Transvaginal oocyte aspiration
8. Embryo biopsy
9. Nuclear transfer cloning
10. Transgenics

Research Tools



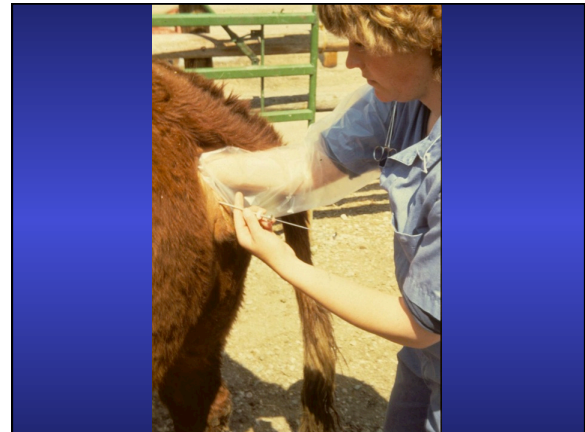
Niche Applications



Routine Use

The Most Important

1. Vaccination programs
2. Electroejaculation
3. Body condition scoring
4. EPDs for bulls



Most Powerful Genetic Tool

AI with genetically superior semen

The Big Combination

Ovulation
synchronization with
hormones

+

AI with superior semen

Combined Tools

- ◆ AI
- ◆ Frozen semen
- ◆ Hormones
- ◆ Induced cycling
- ◆ EPDs, Genomics
- ◆ Sexed semen?

Benefits

- ◆ Genetic superiority
- ◆ Pregnant earlier
- ◆ Calving ease, Polled
- ◆ Concentrate calving
- ◆ Sex selection
- ◆ 1-day AI

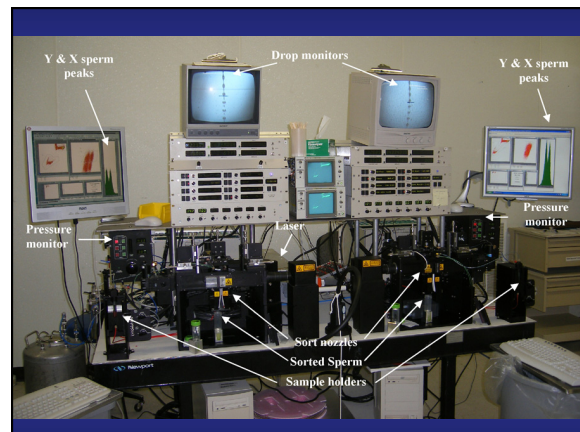
Niche Technologies

- ◆ Induced calving
- ◆ Ultrasound
- ◆ Sexed semen
- ◆ Embryo transfer

Ultrasound

- ◆ Early pregnancy diagnosis
- ◆ Sexing fetuses
- ◆ Ovarian status
- ◆ Diagnose pathology

Sex is THE most important genetic trait



SPERM SORTER

25,000 sperm/sec
80,000 drops/sec
180,000 measurements/detector/sec
80 km/hour
Cost: >\$500,000 for 2-nozzle version

SORT RATES

- ◆ Can exceed 5,000 sperm/sec of Each sex at 90% purity
- ◆ In practice about 15,000,000/h
- ◆ Too slow to use normal sperm numbers / dose economically

Sexed Semen

- ◆ \$20 extra
- ◆ Lower fertility
- ◆ 90% accurate
- ◆ Excellent management
- ◆ Calves normal

Pregnancy Rates with Sexed Sperm

Semen type	No. 1 st services	% preg	No. 2 nd services	% preg
Sexed	28,980	45	7,326	42
Control	25,024	56	14,984	53

Select Sires customers with >50 AI per group.

DeJarnette et al., 2009

Percentage Points vs. Percent

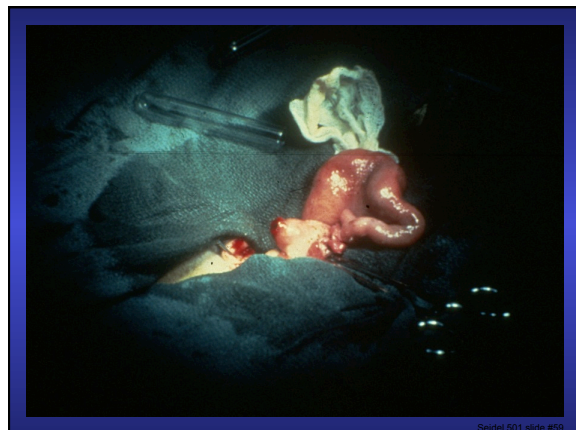
- ◆ 50% vs 40%
- ◆ 10 percentage points
- ◆ 20% fewer pregnant

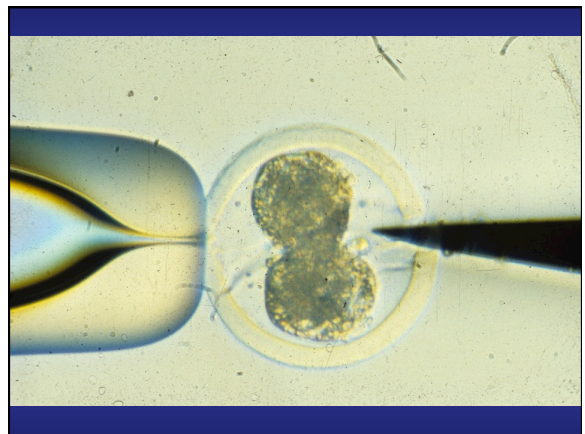
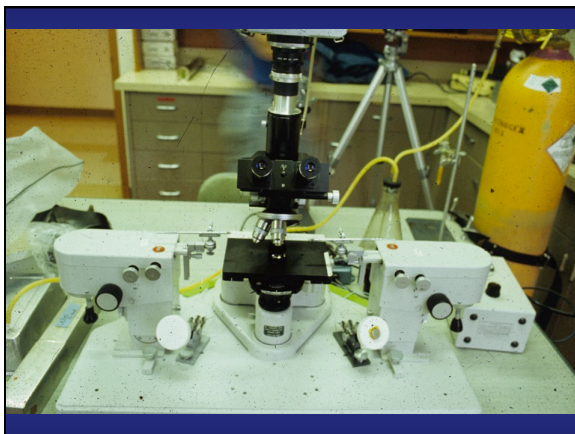
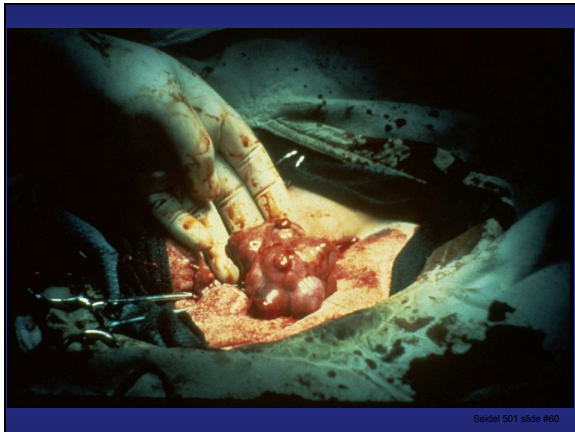
Sexed Semen

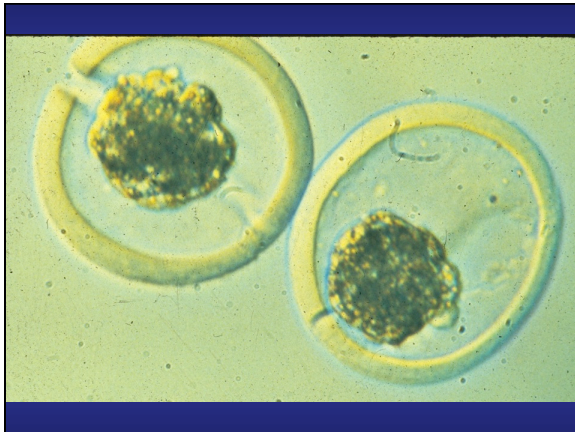
- ◆ Use for heifers
- ◆ Less dystocia
- ◆ First services

Embryo Transfer

- ◆ Superovulation
- ◆ AI
- ◆ NS embryo recovery & transfer
- ◆ Freezing
- ◆ 1/400 beef calves







Genetically Modified Plants & Animals

- ◆ 90% corn
- ◆ 90% soybeans
- ◆ 80% papaya
- ◆ 0% cattle

TRANSGENESIS

ADD GENES

DELETE GENES

CORRECT GENES



Transgenic Applications

- ◆ More efficient growth
- ◆ Polled (no horns)
- ◆ Resistance to disease
- ◆ Pharmaceuticals in milk

Growth Genes on Y Chromosome

- ◆ Females remain smaller
- ◆ Extra growth expressed only after birth
- ◆ Sexed semen
 - Larger males
 - Smaller females



Beef Production with No Cow Herd

- ◆ Each heifer replaces self with a calf
- ◆ Wean at 3 months
- ◆ Fatten for 2 months

Seedstock Bulls

- ◆ Produce embryos in vitro
- ◆ Pick the best 1% with genomics
- ◆ 2 versions
 - ★ Only X sperm
 - ★ Only Y sperm



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