Sexed Semen & More

WWS美國環球牛精液公司
新耕有限公司
鄒年烘 先生主講102.06.05

Presentation Overview

1. Sexed semen overview
2. U.S. milk production trends
3. WWS overview

Sexed Semen Processing Overview

The Discovery & Development of Semen Sexing

- Early-mid 1980's: United States Department of Agriculture (USDA) begins lab research on sperm sorting
- Late 80's/early 90's: Commercial development and field research begins
  - 1989: First live calf resulting from sexed semen is born
- 2003: Sexing Technologies (ST) acquires U.S. rights to process and market sexed semen

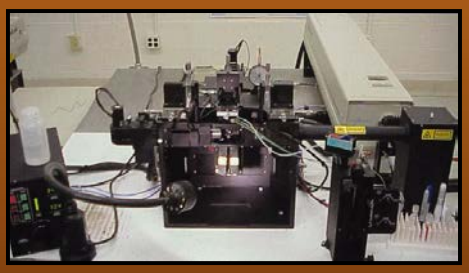
*gender*SELECTed™ Semen: the Early Stages

- Dec. 2004 – Jan. 2005: 3 Holstein bulls and 1 Jersey bull sent to Sexing Technologies (ST) in Texas
  - Semen collected and market application research begins
- March 2005: Additional semen made available
- Nov. 2005: Initiation of marketing efforts
  - Additional bulls sent to ST in Texas

*gender*SELECTed™ Semen: the Early Stages

*gender*SELECTed™ Semen: Expanded Production

- February 27, 2006: ST opens on-site facility at Select Sires, Plain City, Ohio
  - 4 flow cytometers (sorters)
  - 250,000-straw annual production capacity
- November 1, 2006: 2 additional sorters installed at Ohio facility
  - 350,000-straw annual production capacity
- 2007-2008: 12 additional sorters installed



Flow cytometer (sorting machine)

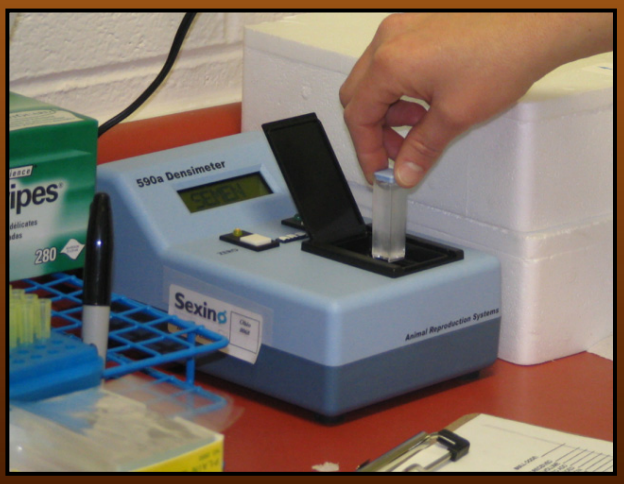
Steps Prior to Semen Reaching Sexing Lab

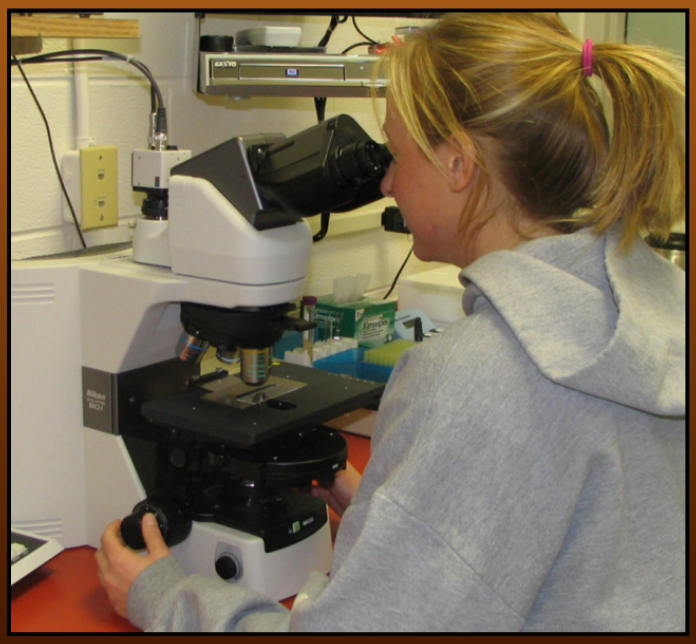
- Semen collected and properly labeled
- Semen evaluated for sperm cell concentration
- Sperm motility estimated

Sexing Technologies Lab at Select Sires

Semen Received at Sexing Lab

Semen Reevaluated by Sexing Lab Technician



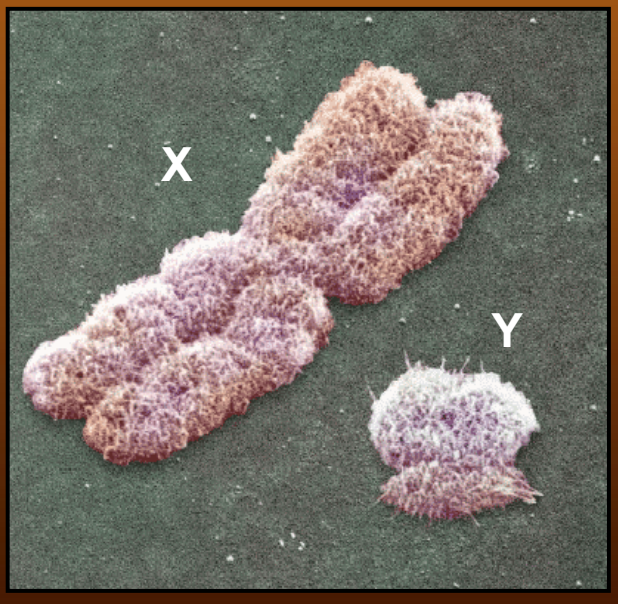


Preparation of Chemicals & Media at Sexing Lab

Semen Sorters & Computers

X & Y Chromosomes

- In cattle, X chromosome (female) contains 3.85% more DNA than Y chromosome (male)
- Used to separate X from Y and observe differences in fluorescence from laser treatment

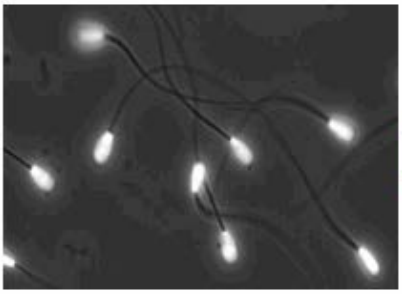


How Semen Sorting Works

Chromosomes

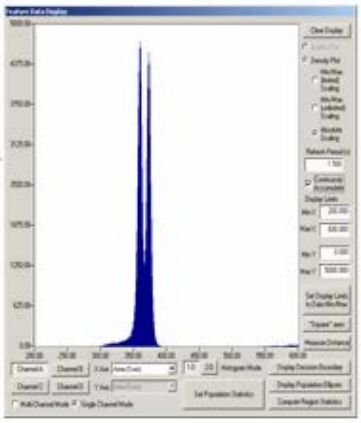
3.85% total DNA difference between bovine X and Y chromosomes

Sperm Cells



Stained sperm cells fluoresce in ultraviolet light.

Measurement



Fluorescence magnitude differs for X and Y cells.

Semen Sorting (Flow Cytometry)

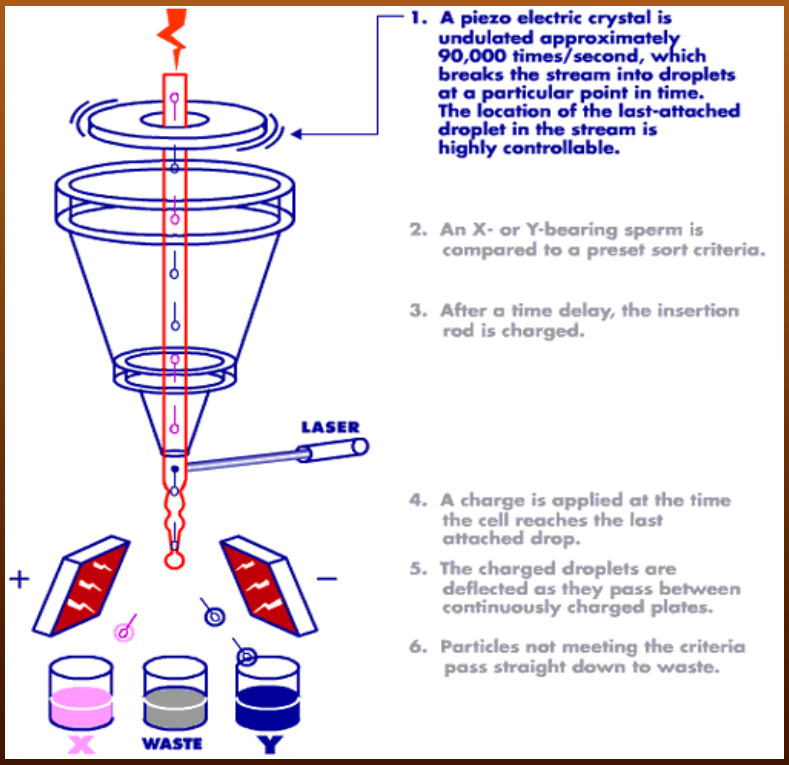
Sexing Technologies Sorting System

Single-file sperm

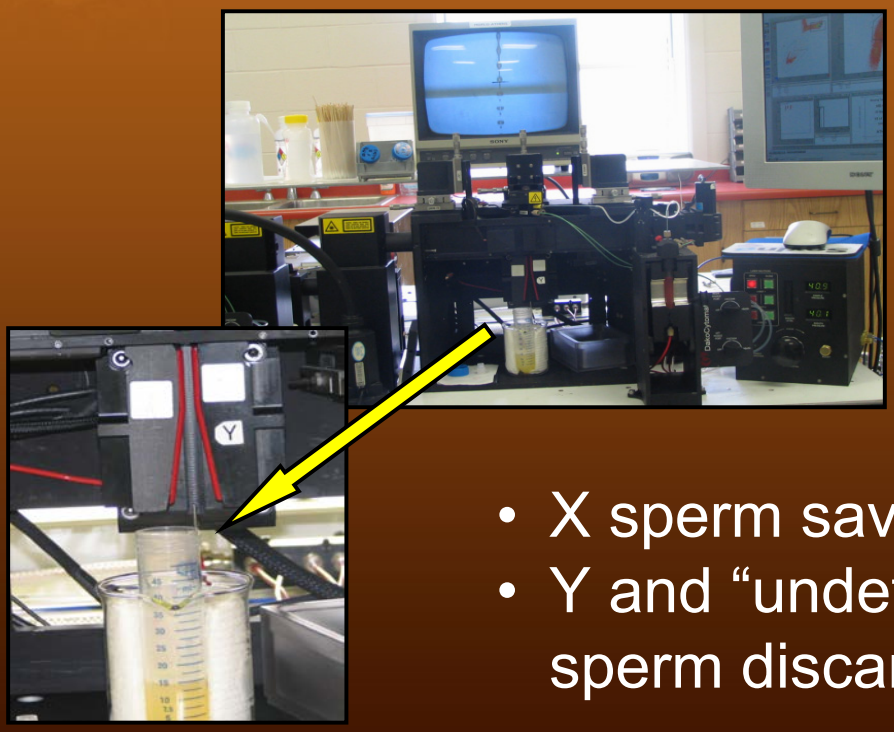
Laser

Electromagnets

Collection tubes

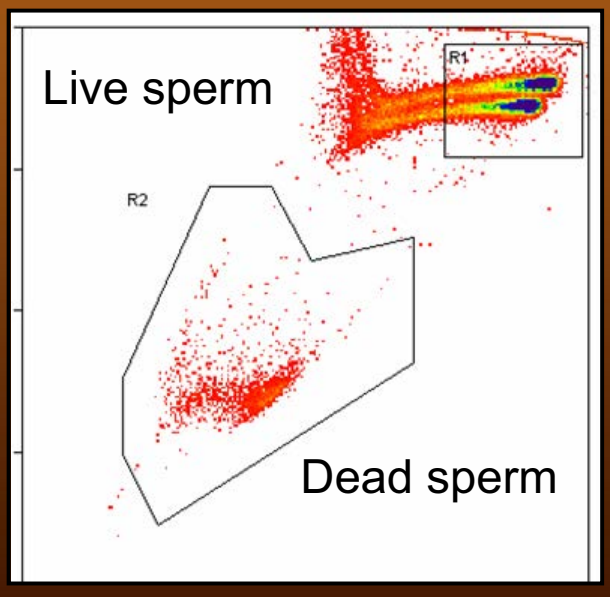


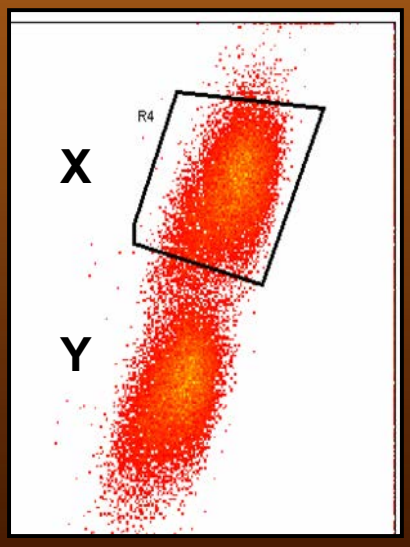
Semen Sorting

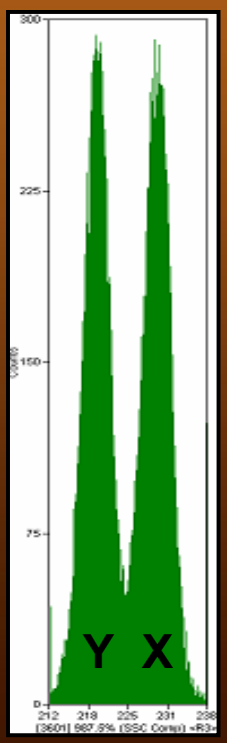


- X sperm saved
- Y and “undetermined” sperm discarded

Flow Cytometer Monitor Displays







Sorters Frequently Adjusted to Reach >90% Female Purity

Semen Quality Analysis

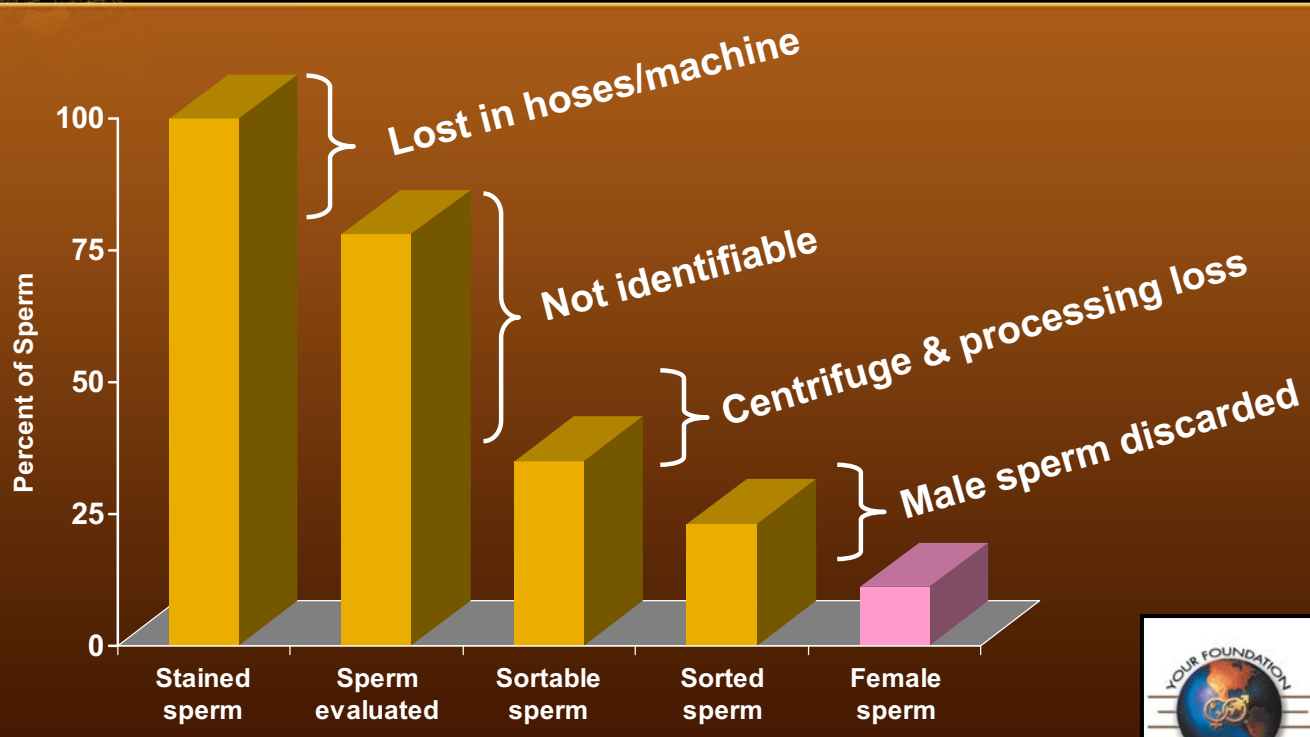
		SEXED SEMEN DATA				
Code	Name	Straws Passed	% Post Sort Motility	% Post Thaw Motility	% Purity Females	% Intact Acrosomes
7HO6546	REMINGTON	8,518	72	57	91	79
7HO6685	BRYCE	9,609	65	49	92	70
7HO6055	BRIGHT	10,062	73	54	91	75
9HO2763	FARADAY	6,570	71	54	91	76
7HO6454	GENISIS	9,479	71	55	90	74
7JE613	BIG TIME	5,134	70	43	91	72
7JE576	SAWYER	9,579	72	54	91	79
RESULTS		**58,951**	**71**	**52**	**91**	**75**

Sexing technologies

SELECT SIRES gender SELECTed™

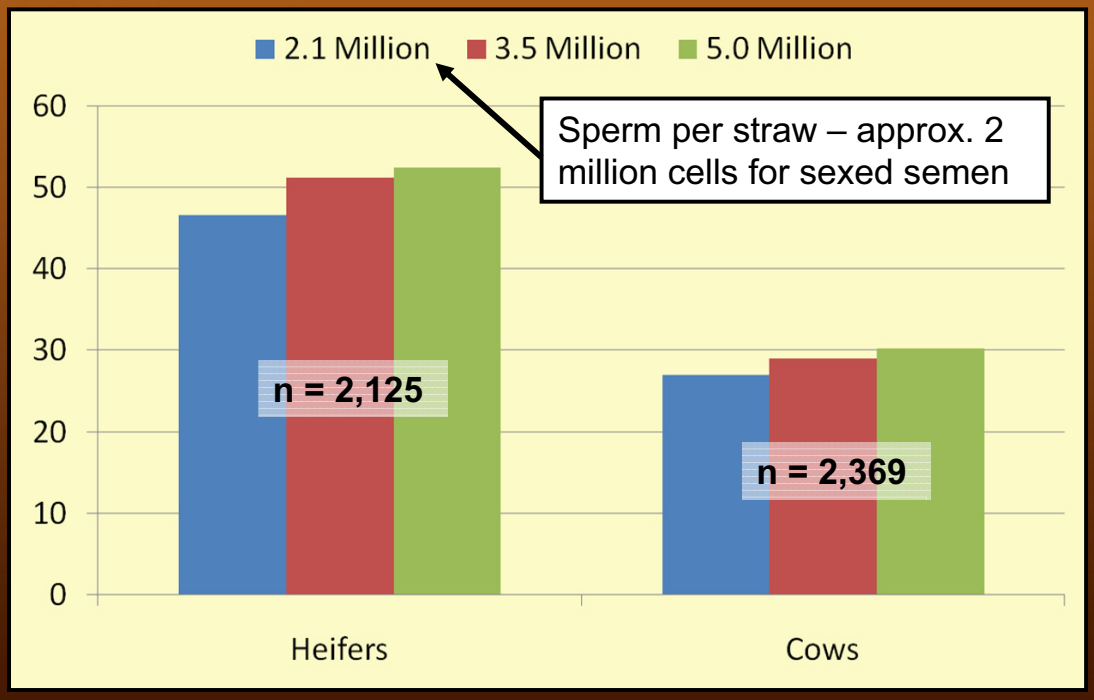
Accelerated Genetics ACCESS Sexed Semen

Sperm Loss During Sorting



Source: Select Sires

Effect of Sperm Concentration on Dairy Cattle Conception

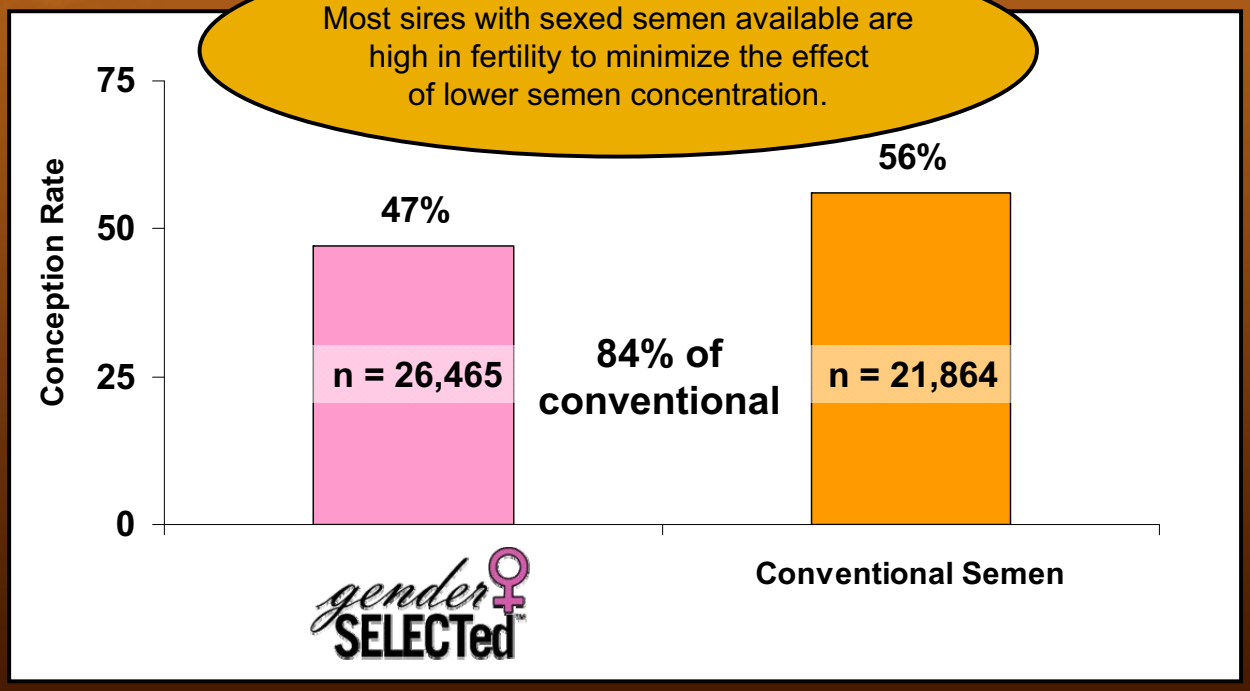


Source: DeJarnette et al., 2008

Sexed Semen Conception Rates

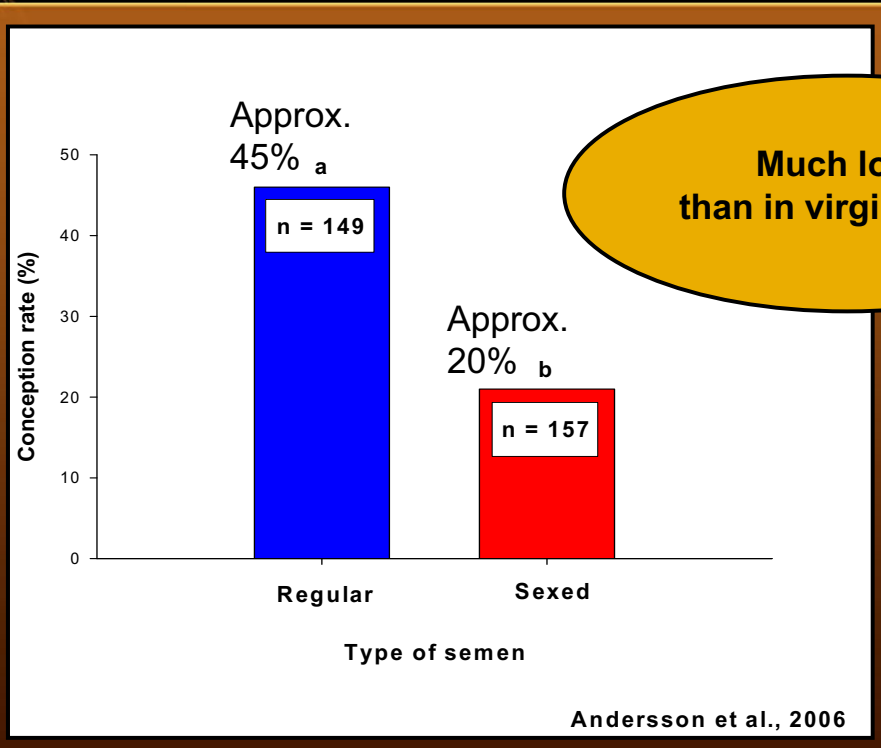
- Lower than conventional semen due to lower sperm concentration
- Average first service conception rate in virgin heifers is generally 75-80% of first service conception rate using conventional (non-sexed) semen
- First conception rate may be 35% or lower for some herds or up to 70% for other herds, depending on various factors

*gender*SELECTed™ Conception Rate in First Service Virgin Heifers



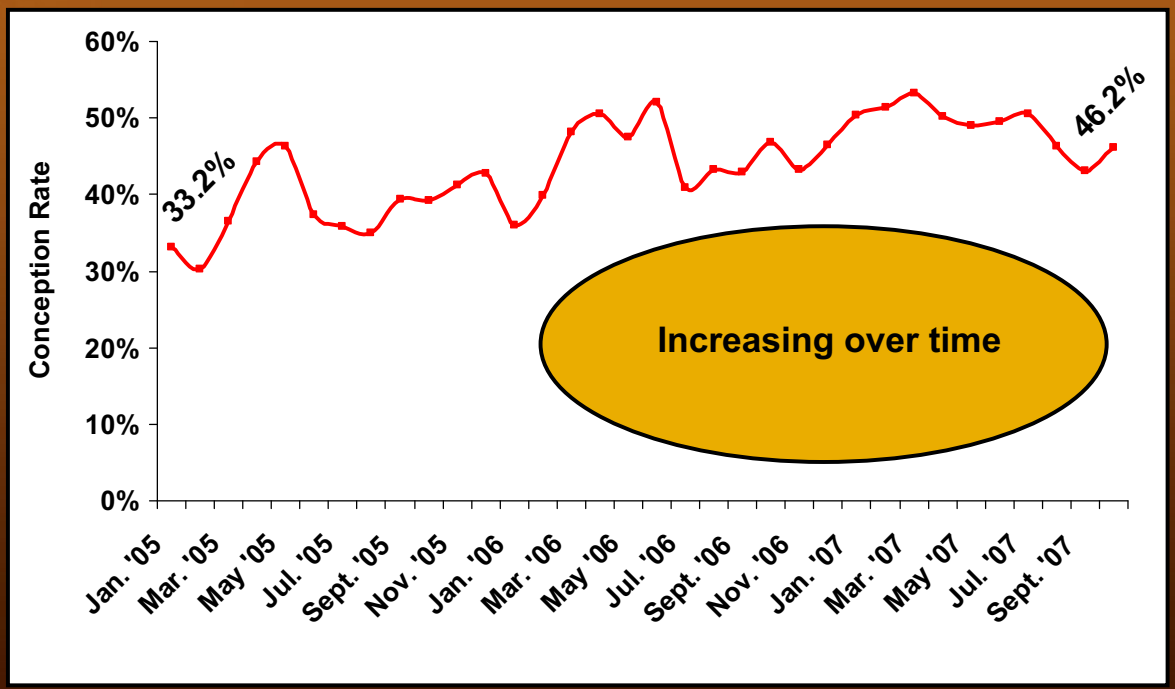
Source: Select Sires

Conception Rate in Dairy Cows Showing Natural Heat



Data supplied by Accelerated Genetics

Trend of *gender*SELECTed™ Conception Rate in Holstein Heifers



Source: Select Sires

Improvements Through the Years

	2003	2008
% females	85-90%	≥ 90%
Avg. Net Merit of sexed sires	$170	$300
Avg. sexed conception rate	30-35%	45-50%

Sexed Semen Handling & A.I. Technique

- Only experienced breeders!
- ¼ cc semen straw
- Use gloves and tweezers
- 35-37 °C water temperature
  - In water for 30-45 seconds
- Post-thaw thermal protection
- Pre-warm A.I. gun
- Put semen in uterus within 5 minutes

Heifer Management Practices

- Use only in virgin heifers that have achieved >60% of mature weight by 14 months
- Use of estrus synchronization and breeding to observed standing heat encouraged
- Inseminate heifers 8-12 hours after observed estrus (AM/PM rule)
- Use of timed A.I. discouraged

Keys to Success Using Sexed Semen

- Use primarily on first or second services in virgin heifers showing true standing heat
- Semen thawing and handling areas should be warm and draft-free
- Warm all semen handling equipment (¼ cc gun, sheaths, paper towels) prior to contacting straws
- Only highly experienced technicians should use this product

Keys to Success Using Sexed Semen

- Don't use in low fertility herds (CR < 60%)
- Extreme temperature protection necessary to prevent cold shock
- Management is biggest impacting factor on fertility

U.S. Dairy Industry

- Total production: 84.4 billion kg
- 67,000 dairy farms
- 9.33 million cows (93% Holsteins)
- 4.03 million cows on milk recording
- 2008 Registered Holstein averages:
  - 11,545 kg M
  - 428 kg F
  - 349 kg P

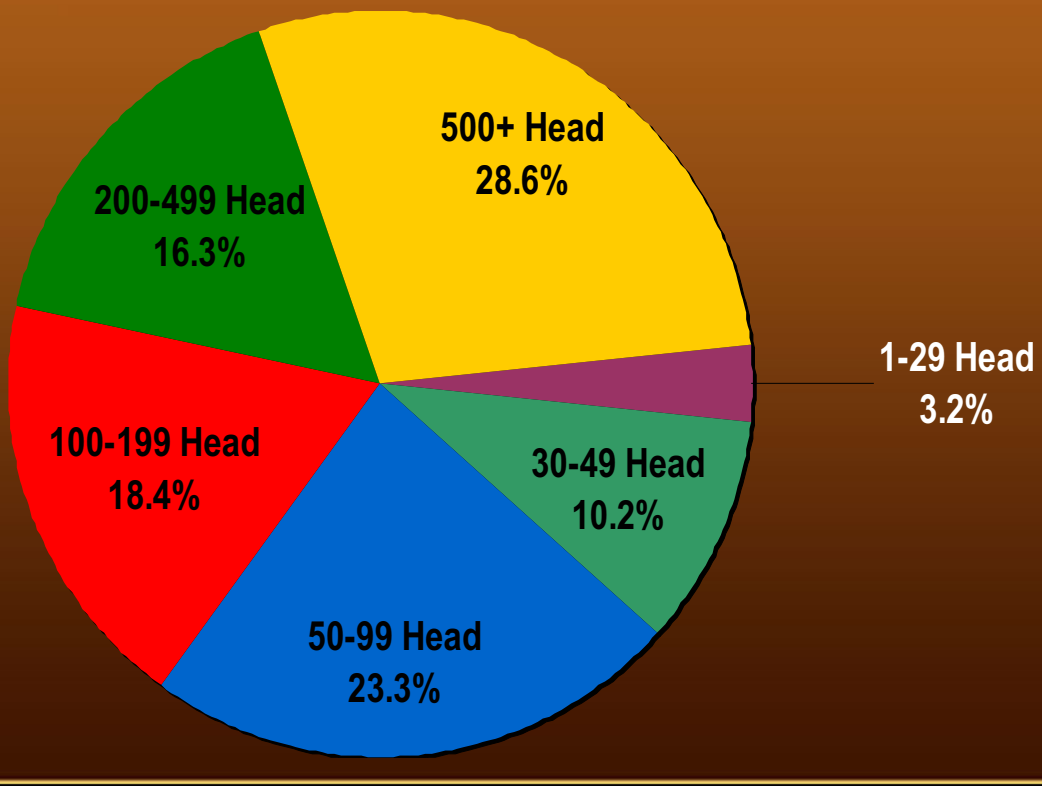
Source: USDA/AIPL, USDA/NAAS, Holstein Association USA; 2008

U.S. Milk Production Trend

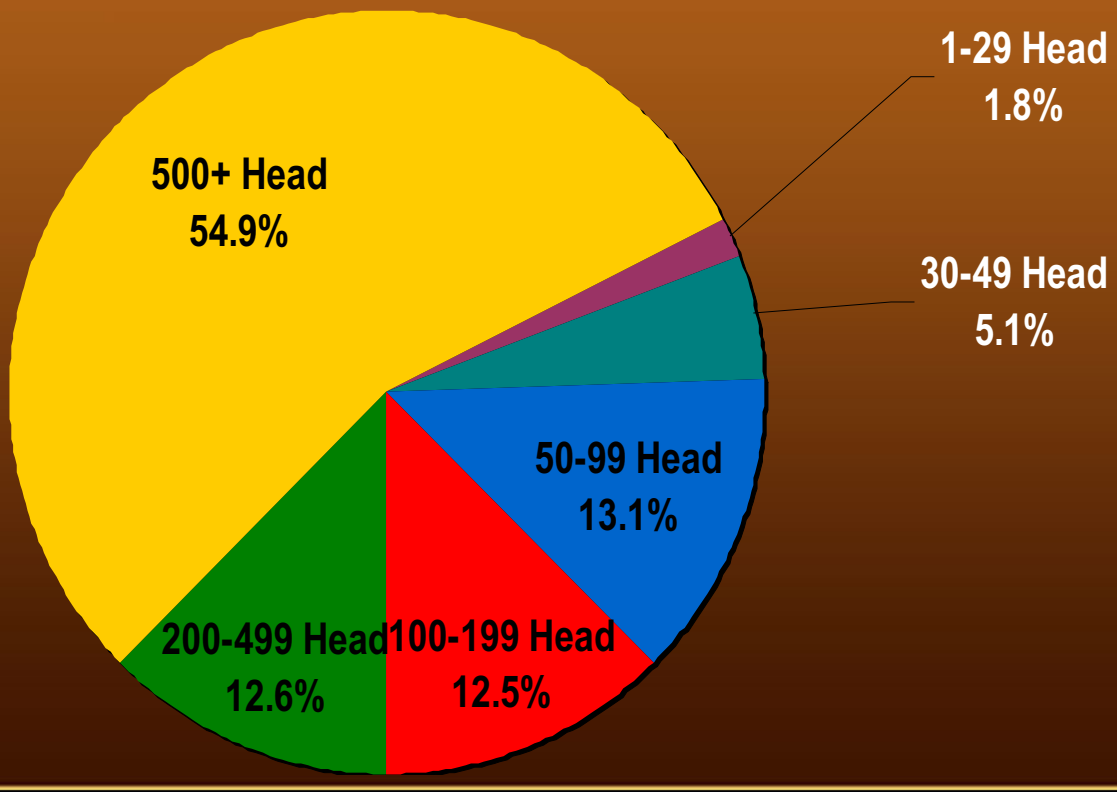
Year	Milk Cows (millions)	Milk/Cow (kg)	Total kg Milk (billions)
1996	9.372	7,470	70.001
1998	9.151	7,811	71.48
2000	9.199	8,271	76.09
2002	9.139	8,458	77.30
2004	9.010	8,617	77.64
2006	9.137	9,024	82.45
2008	9.315	9,251	86.18

Source: USDA-NASS

U.S. Herd Sizes (1999)



U.S. Herd Sizes (2008)



U.S. Dairies Under 500 Cows

Year	No. Herds	% of Total	No. Cows	% of Total
1992	153,645	98.91%	7,798,858	82.16%
1997	114,617	98.07%	6,581,223	72.36%
2002	89,087	96.85%	5,364,144	58.92%
2007	66,606	95.30%	4,403,727	47.42%
***2012**	**49,622**	**93.49%**	**3,440,988**	**37.43%**

Source: U.S. Census of Agriculture *2012 figures are projected

U.S. Dairies Over 1,000 Cows

Year	No. Herds	% of Total	No. Cows	% of Total
1992	564	0.36%	937,358	9.88%
1997	878	0.75%	1,589,844	17.48%
2002	1,256	1.37%	2,624,508	28.83%
2007	1,582	2.26%	3,700,982	39.85%
***2012**	**1,803**	**3.40%**	**4,587,316**	**49.90%**

Source: U.S. Census of Agriculture *2012 figures are projected

World Wide Sires Overview

With highest integrity, World Wide Sires provides industry leading genetics and services to ensure continued success for our global customers.

1971: WWS Founded by Mr. Bill Clark

Bill Clark

- California dairyman
- Breeder of Cal-Clark Board Chairman, MGS of 7HO1897 BLACKSTAR
- Hosted international guests
- Marketed animals overseas
- Identified global need for and interest in U.S. dairy genetics

2001: WWS Acquired by Select Sires and Accelerated Genetics

- Select Sires and Accelerated Genetics purchase WWS for all sales and marketing outside the Americas

Select Sires: World's Largest A.I. Cooperative

- Comprised of 10 farmer-owned and controlled cooperatives based in Plain City, Ohio
- Over 11 million units of semen sold globally each year
- Approximately 1,900 bulls housed in 59 barns

Accelerated Genetics: Brand New Production Facilities

- Farmer-owned and controlled co-op based out of Baraboo, WI
- 700 dairy and beef sires housed at production facilities in Westby, WI
- Over 5 million units of semen sold globally each year
- Founder of Genetic Visions, Inc., in-house research facility and pioneer in genetic marker testing

Elite Product to Fit Each Market

- 209 Proven bulls
  - 153 Holstein
  - 56 colored breeds
- 110 genomically enhanced young sires (G Force program)
- Product available from 6 dairy and 12 beef breeds
- **69,000 farmer-owners!**

G FORCE

Source: U.S. A.I. co-ops, January 2010

WWS: Global Sales Network

3,577,699 Doses

Europe

Africa

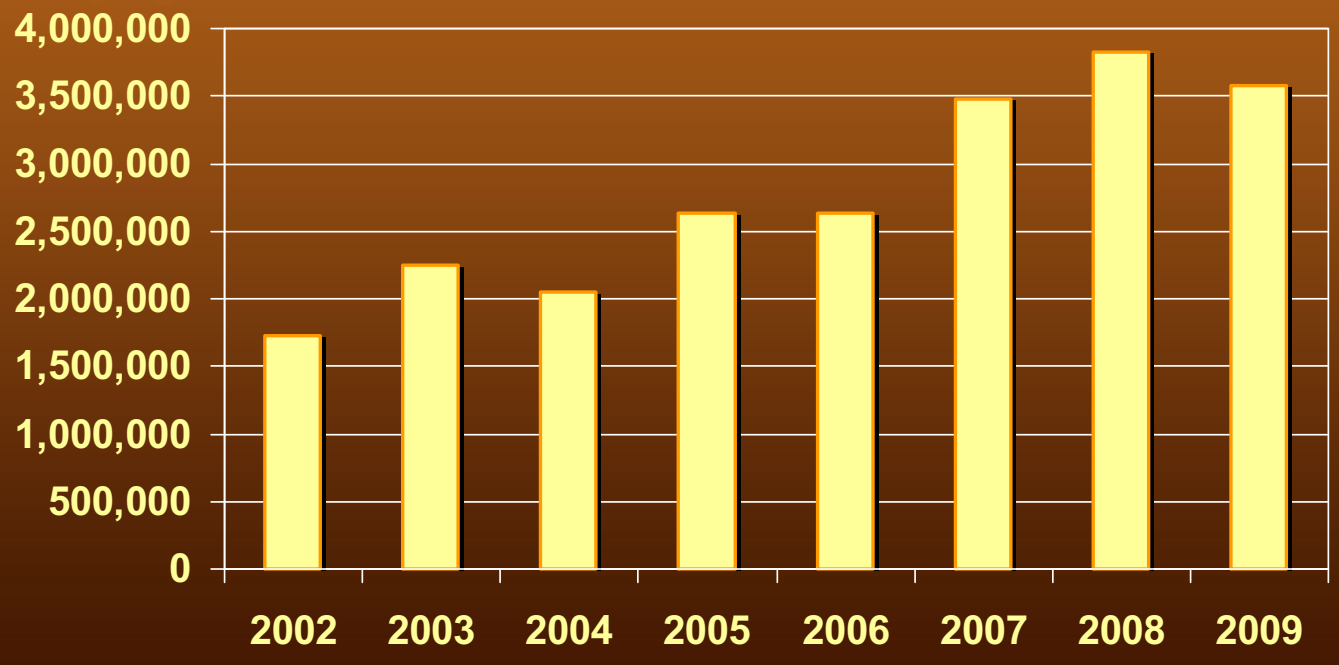
Asia

Oceania

Middle East

67 Countries

WWS Annual Unit Sales



謝謝指教！