An integrated approach to development and application of precise methods of estrous cycle control for beef heifers and cows

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Seminar Outline

➢ Background & rationale.

➢ Why we considered developing an integrated proposal for NRI?

➢ What we're doing & how we're doing it.

The current status of reproductive technology in the U.S. beef cattle industry……

Reproductive Technologies Available or on the Horizon

- Estrus synchronization and AI
- Ultrasonography
- Sexed semen
- Embryo transfer
- In vitro production of embryos
- Transgenics (pharming)
- Cloning
- Male fertility

The U.S. Beef Herd

- **69% of cow-calf enterprises are secondary income sources**

- **50% of producers report an established breeding season of specific duration**

- **34% of beef herds are routinely pregnancy checked**

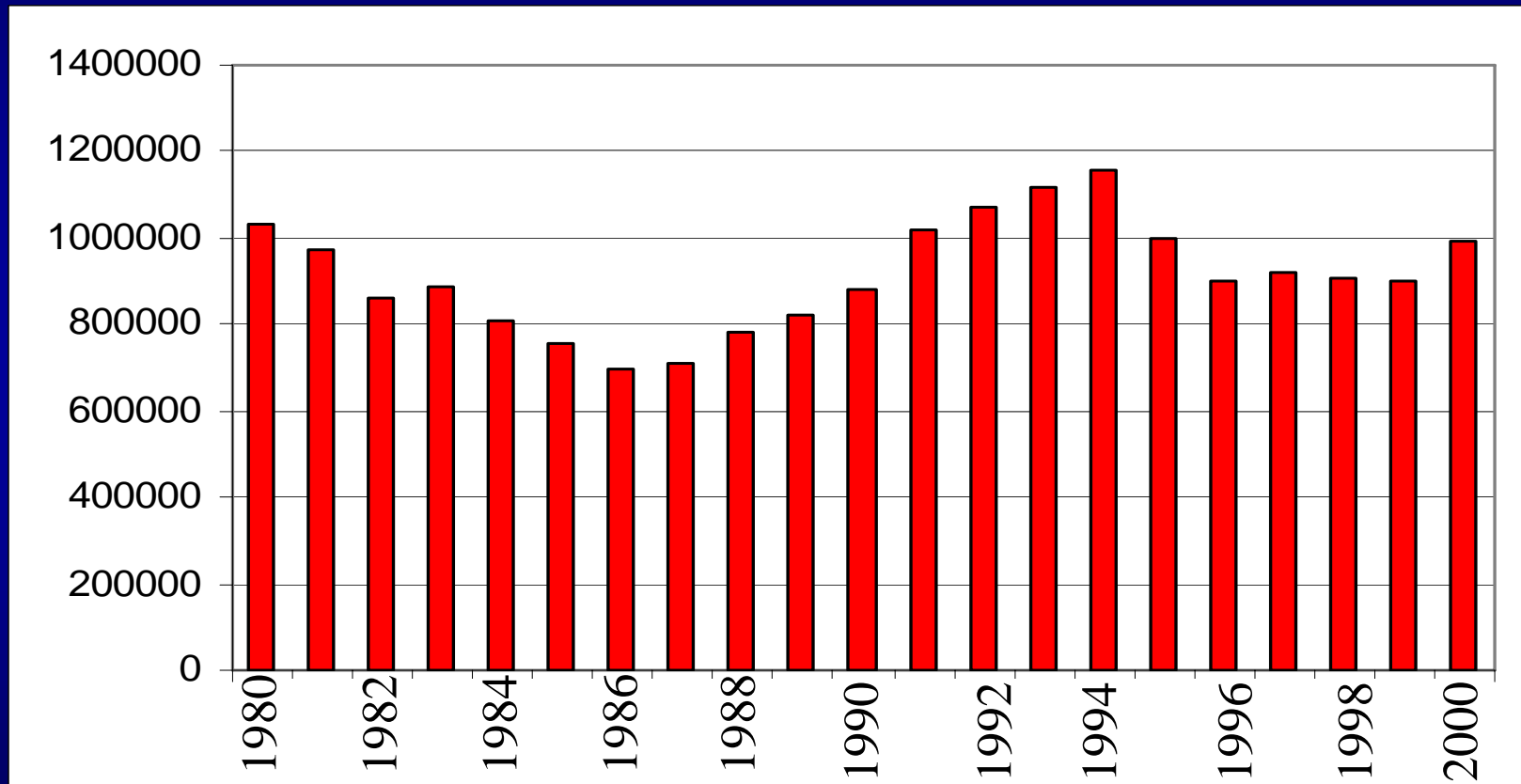- **10% of beef cattle enterprises utilize AI**

What's happening in adoption of technology in the beef industry on a global basis?
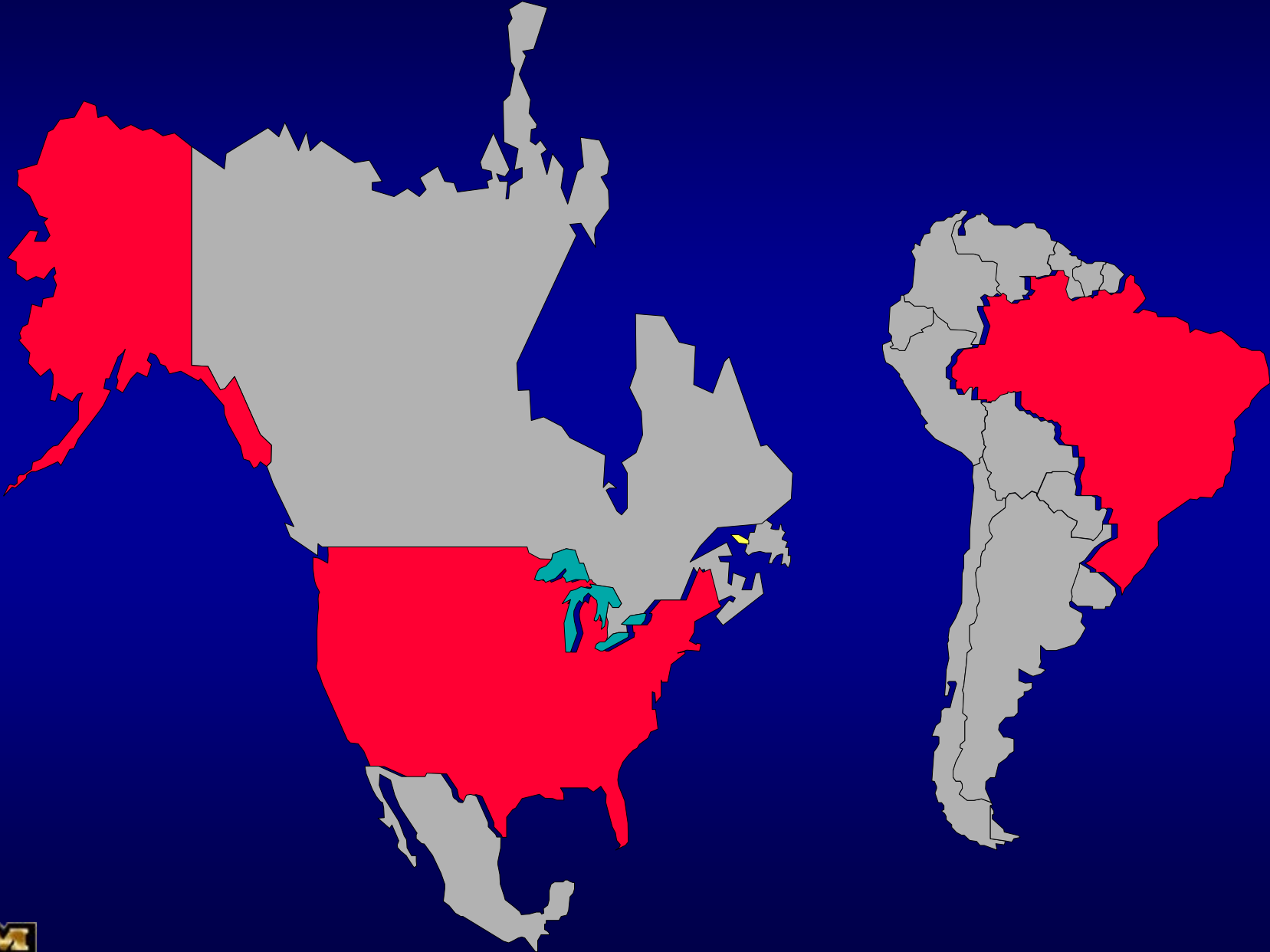
In the U.S. …...
Total Domestic Sales of Beef Semen

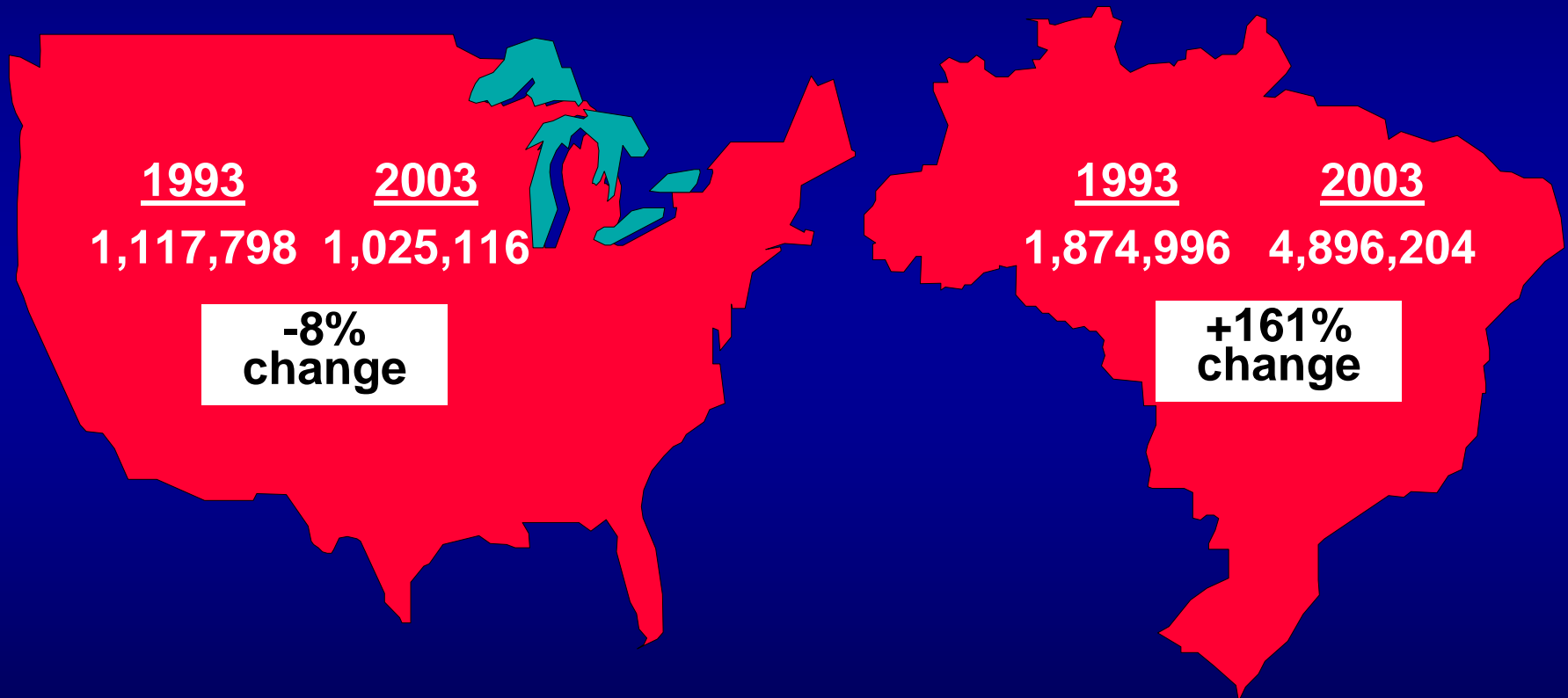Hough,, 2002

Comparison of AI Use In Beef Cattle (U.S. vs. Brazil)

Import and Domestic Beef Semen Sales
(units sold)

1993	2003
1,117,798	1,025,116

-8% change

1993	2003
1,874,996	4,896,204

+161% change

Reasons Beef Producers in the U.S. Cite for not Using Reproductive Procedures
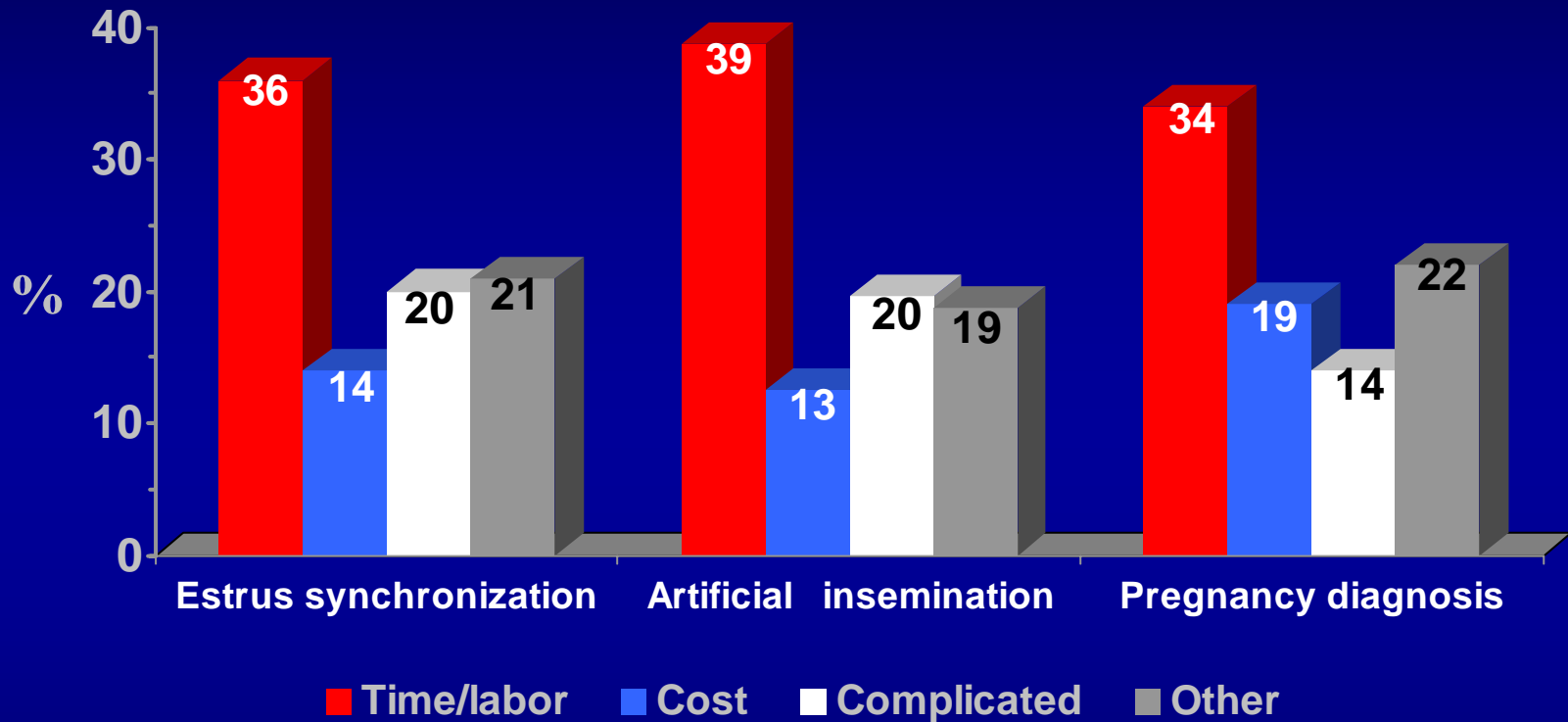
From NAHMS Survey, 1998

Why have we focused our efforts on estrus synchronization and AI in beef cattle?

Artificial insemination and estrus synchronization are generally regarded as the <u>most important</u> and <u>applicable</u> of all available biotechnologies to the beef cattle industry (Seidel, 1995).

A unique point in time for the U.S. beef industry……….

- Availability of tools and understanding of methods to control the estrous cycle in cattle

- A changing market structure that recognizes and rewards quality

- Unless efforts are taken to implement change in the U.S. beef cattle industry, the products of our research and technology may be exported to more competitive international markets . . . . . .

Main objective of our USDA-NRI proposal

- Renewal of USDA-NRI 00-35203-9175 "Developing Precise Methods of Estrous Cycle Control for Beef Cows and Heifers"

- Increase successful adoption of estrus synchronization and AI in beef cattle

Our Dilemma

- Fixed-time AI programs do not work as predictably in heifers as in cows.

- Success rates using fixed-time AI in postpartum beef cows warrant an organized effort to increase application and successful use.

USDA-NRI Integrated Projects

- Involve a combination (must include 2 of 3)
  - Research
  - Education
  - Extension
- Integrated projects are expected to
  - Generate new knowledge
  - Apply existing knowledge quickly

3 Primary Themes

➢ Outcome oriented

➢ Stakeholder driven

➢ Problem focused

Collectively, we proposed ……

- A means to facilitate implementation of integrated animal production systems that will contribute to sustainability of the animal production unit and are key to future application of biotechnologies in the beef cattle sector.

Specific Aims

➢ The *Specific Aims* of our project are based on the economic need to improve the competitive position of the U.S. beef industry through an increase in adoption of reproductive procedures that facilitate improvements in reproductive management and adoption of AI.

Specific Aims

- *Research* new reproductive management strategies for replacement beef heifers

- *Transfer of technology* to synchronize estrus in postpartum beef cows to facilitate fixed-time AI

- *Develop a comprehensive education program* for veterinarians, extension field staff, veterinary students and animal science graduate and undergraduate students

Research Component

➢ ***Problem.*** Estrus synchronization protocols for beef heifers fail to result in acceptable pregnancy rates following fixed-time AI.

➢ ***Approach.*** *Research* new reproductive management strategies for replacement beef heifers that lead to improved methods of fixed-time AI for replacement beef heifers.

Extension/Outreach Component

➢ The challenge of transferring technology (estrus synchronization and AI) to the private sector exceeds the task of research and development of still newer technologies……….

➢ Improvements in methods to synchronize estrus create the opportunity to significantly expand the use of AI in the U.S. cowherd …………………..

The Technology Problem

Research

$\downarrow$

More technology, complexity & sophistication

$\downarrow$ ← **Limiting step**

Fewer people understand it

$\downarrow$

Fewer people trust it

$\downarrow$

Progress is slowed

Pregnany rates in postpartum beef cows after treatment with various estrus synchronization protocols.

Treatment	Pregnancy rate	
AI based on detected estrus	No.	%
2 shot PG	147/422	35
Select Synch	237/528	45
MGA-PG	220/408	54
MGA Select	195/313	62
7-11 Synch	101/155	65
Fixed-time AI		
MGA Select	482/763	63
7-11 Synch	446/728	61
CO-Synch + CIDR	1963/3015	65

CO-Synch + CIDR with fixed-time AI @ 66 hrs after PG and CIDR removal				
	No. Herds	No. Cows	AI Preg. Rate (%) Range	AI Preg. Rate (%) Mean
Fixed-time AI results	34	3015	60-86%	1963/3015 65%

Extension/Outreach Component

➤ Organized on-farm demonstrations and field trials

➤ Producer programs and field days

➤ Estimated economic impact

Educational Component

➢ *Develop a comprehensive education program* for veterinarians, extension field staff, veterinary students and animal science graduate and undergraduate students

  ➢ Curriculum modules
    ➢ Estrous cycle
    ➢ Management factors involved with successful estrus synchronization programs
    ➢ Overview of estrus synchronization programs
    ➢ Overview of fixed-time AI programs

  ➢ Internship in reproductive management involving fixed-time AI of beef cows and heifers

MU animal science students interned at farms and ranches in Missouri, Montana and Oregon where they acquired skills that will bring long-term benefits to the Missouri beef industry. From left, with hometowns are: front row, Dona Funk, Lawson; Trista Strauch, Hamburg, IL; Stacey Wood, La Monte; Ryan Walrath, Columbia; and Jim Williams, professor of animal science. Back row, David Patterson, associate professor of animal science and coordinator of the internships; Nick Hammett, Columbia; John Wheeler, Williamstown; and Keenan Switzer, Bucklin. According to Williams, students returned to his beef production course more poised and self-confident.

Internships breed
INDEPENDENCE

by Duane Dailey

Internships take students out of the classroom and into the world. Last spring, seven MU animal science students applied their academic knowledge of animal reproduction at farms and ranches from Armstrong, Mo., to Augusta, Mont., where they artificially inseminated beef replacement heifers.

Recently, the returning students told their stay-at-home classmates of their hands-on — or in this case, hands-in —

experiences. Ryan Walrath stood before a large group of animal science students and faculty in an ASRC lecture hall, showing slides and a videotape equivalent of "What I Did Last Summer."

Ryan and fellow student Keenan Switzer went to Broken O Ranch in Montana. It was far removed from anything they'd seen at the MU Beef Farm, where they had practiced AI five or six hours a week in their reproduction class. Broken O

had 150,000 acres of range, 8,000 mother cows, buffalo and — most important for the learning — 1,500 replacement heifers to be artificially inseminated.

The students had to step in, right along with ranch hands, to take their turns in the five breeding boxes set up to handle the heifers in an assembly line.

Ryan recalled his first turn, "I heard the door to box one open, and the heifer ran out. Then door two, door three, door four.

Collaborations

- AI industry
- Pharmaceutical industry
- Extension field staff
- Veterinarians
- Beef producers

Project Team

- Campus-based faculty, staff and graduate students

- Regional extension livestock specialists

- Veterinarians

- MU farms and centers

- Cooperating farms and ranches

Evaluation

- Process will be ongoing with each aspect of the project
  - Research
    - Outcomes from experiments
  - Extension
    - On-farm demonstrations
    - Economic assessment
  - Education
    - Curriculum development
    - Student internships

Expected Project Accomplishments

➤ Improved methods to facilitate fixed-time AI in beef heifers.

➤ Improved understanding of methods currently available to facilitate fixed-time AI in beef cows.

➤ Development of curricula that will ensure on-going education in the area of estrous cycle control in beef cattle.

The anticipated outcomes of this program include:

- <u>1) Expanded working relationships among producers, extension specialists, and veterinarians.</u> These relationships will improve information exchange and management and are expected to continue after the Grant is completed.

- <u>2) Increased profit for beef operations resulting from improvements in reproductive management.</u>

  Ultimately, increased profits will be achieved through change in calving distribution patterns of herds, to where higher percentages of cows calve during a more concentrated time frame and earlier in the calving period, in addition to the improvement in genetics that result from use of high accuracy superior sires.

MU Thompson Farm