Artificial Insemination Program

A two-day workshop designed to educate beef and dairy producers to breed their own cattle

Extension
UNIVERSITY OF WISCONSIN–MADISON

Artificial Insemination Program

Agenda

Pre-Test

Presentations

EPD Activity –Beef

PTA Activity – Dairy

Getting the Herd You Want Through Improved Genetic Selection

Understanding Sire Summaries

Determining Bovine Pregnancy Status

Chart of Pregnancy detection methods

Beef Cow Synchronization Protocols

Dairy Cow Synchronization Protocols

Dairy Heifer Synchronization Protocols

Summary of Semen Handling

Semen Tank Inventory Sheet

Summary of Female Hormones

Fertility Rate Goals Sheet

Post – Test

Evaluation

Artificial Insemination Program

A two-day workshop designed to educate dairy and beef producers to breed their own cattle

Overall Goal of Course: Give the learner exposure to Artificial Insemination Technique so they can breed their own cattle.

Topics include: Reproductive Anatomy and Physiology, AI Technique, AI Equipment, Heat Detection, Estrous Synchronization Protocols, Bull Selection, and Pregnancy Detection.

Program Format:

Agriculture Educators with the University of Wisconsin – Division of Extension designed this workshop to teach farmers how to breed their own cattle. Curricula for this program teaches farmers about the hormones involved in the estrous cycle and how to manipulate them through synchronization.

The Artificial Insemination Program is a two-day workshop that features an interactive and fun approach to learning about breeding cattle. Hands-on activities are used throughout the program to assist participants in learning about breeding their cattle.

A certificate of completion is awarded to those who successfully complete the program.

Materials Needed:

- Host Farm – with cows we can practice breeding
- Written materials and PowerPoints
- Equipment for PowerPoint presentations: Computer, projector, screen, speakers
- AI Equipment: Tank, AI guns, practice semen, tweezers, scissors, lubricant, palpation sleeves, sheaths, milking gloves, thaw unit, towels
- Reproductive tracts and trays
- Cleaning supplies: Garbage bags, bleach spray, paper towels
- Box to carry supplies

Course Outcomes:

Upon completion of this two-day course the learner shall understand:

1. Female bovine anatomy
2. The estrous cycle
3. Artificial insemination technique
4. Equipment used
5. Heat detection and detection aids
6. Estrous synchronization
7. Bull selection
8. Pregnancy detection

Outcome competency is determined by:

1. Pre/ Post Test
2. Demonstration of proper semen handling
3. Demonstration of proper artificial insemination gun placement
4. Demonstration of vena puncture using tail vein

Artificial Insemination Program

Agenda Day 1:

8:30 am **Registration and Introductions**

9:00 am **Reproductive Anatomy and Physiology –UW-Extension Agent**
This section will cover key components of the female reproductive tract and hormones involved in regulation of their function.

10:00 am **AI Technique— UW-Extension Agent**
This section will discuss how to palpate, pass the cervix and position the insemination rod for optimal fertility within the female reproductive tract.

10:30 am **Reproductive tracts and semen handling— UW-Extension Agent**
During this session participants will work with reproductive tracts and practice handling and thawing semen and loading it into the insemination rod.

11:30 am **AI Equipment—Guest Speaker**
Explanation of equipment involved in storing and thawing semen and inseminating cows. Along with associated costs.

12:00 pm **Lunch (provided)**

1:00 pm **Practice with cows**

3:00 pm **Adjourn**

Agenda Day 2:

8:30 am **Registration and Introductions**

9:00 am **Heat Detection— UW-Extension Agent**
The science and "art" of proper heat detection and heat detection aids

9:30 am **Estrous Synchronization Protocols—UW-Extension Agent**
This section will explain the most current synchronization protocols, highlighting their individual benefits or drawbacks.

10:30 am **Bull Selection— UW-Extension Agent**
This section will explain how to read sire proofs, and discuss how each number in the sire proof is calculated.

11:00 am **Pregnancy Detection— UW-Extension Agent**
This section will explain different methods of pregnancy detection.

12:00 pm **Lunch (Provided)**

12:30 pm **Written Exam**

1:00 pm **Practice with cows**
Students will be asked to demonstrate proper method of thawing, loading, and inseminating cows

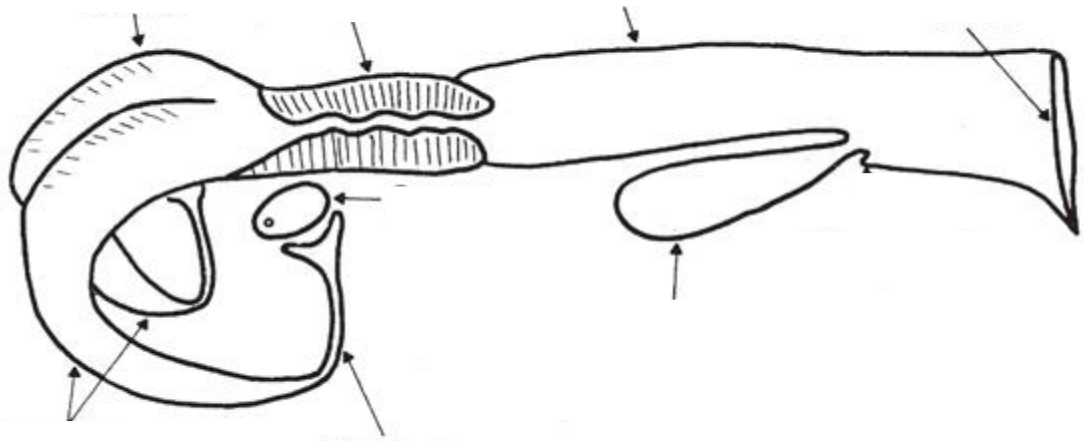
4:00 pm **Evaluations and Award Certificates**

Artificial Insemination Examination – Pre Test

Name: _____

1. Label the following parts of the female reproductive tract

Uterine Horn	Cervix	Vagina	Ovary
Vulva	Bladder	Uterus	Oviduct



2. List three signs a female is in heat.

3. Eggs are produced by the ovaries. Do both ovaries release eggs in each estrus cycle? Explain.

4. Why is it important to place the semen in the uterine body?

5. What are three reasons for determining pregnancy status?

6. What are two choices available for pregnancy diagnosis?

7. List 2 tools you can use for detecting heat.

8. T/F Pregnancy synchronization protocols work 100% of the time?
9. T/F Synchronization protocols are different for Beef and Dairy animals?
10. T/F The purpose of estrus synchronization is to bring a group of females into estrus at the same time.

Artificial Insemination

Presented by:
Heather Schlesser, Extension Marathon County
Sandy Stuttgen, Extension Taylor County

Some slides were adopted from:
Aerica Bjurstrom, Extension Kewanee County
Katie Pfeiffer, Select Sires

Outline

- Anatomy
- Physiology: Estrous Cycle
- AI technique and where to place the semen
- Equipment
- Heat Detection
- Estrous Synchronization
- Bull Selection
- Pregnancy Detection

ANATOMY

Major Structures

- External Genitalia
- Vagina
- Cervix
- Uterus
- Oviducts
- Ovaries

Female Reproductive Tract

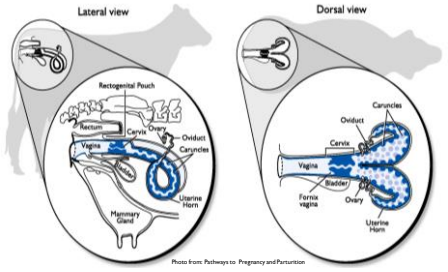


Photo from: Pathways to Pregnancy and Parturition

External Genitalia

- A – Anus
- CB – Cutaneous Bridge
- DC – Dorsal Commissure
- VC – Ventral Commissure
- RL – Right Labia
- LL – Left Labia

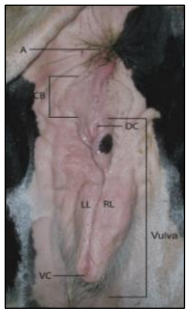
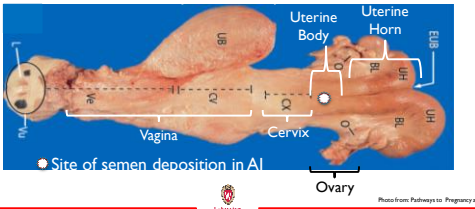


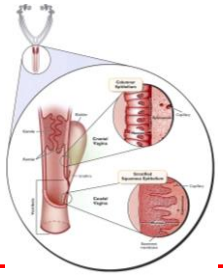
Photo from: Pathways to Pregnancy and Parturition

Cow Reproductive Tract



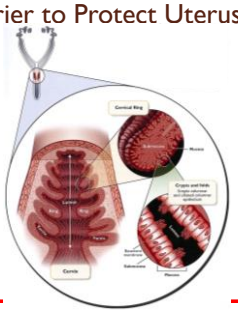
Photos from: Pathways to Pregnancy and Parturition

Vagina – Copulatory Organ



Photos from: Pathways to Pregnancy and Parturition

Cervix – Barrier to Protect Uterus



Photos from: Pathways to Pregnancy and Parturition

Cervix

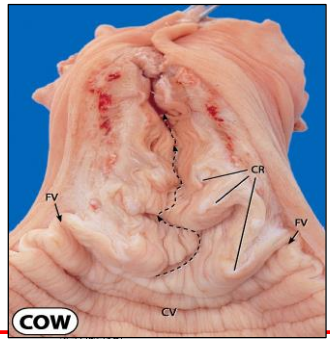


Photo from: Pathways to Pregnancy and Parturition

Uterine Horn – Organ of Pregnancy

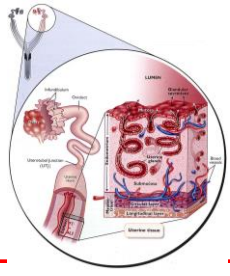


Photo from: Pathways to Pregnancy and Parturition

Oviduct – Site of Fertilization

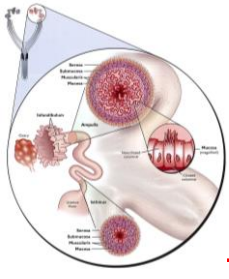


Photo from: Pathways to Pregnancy and Parturition

Ovary

1º Function:

- Produce:
  - Ova
  - P
  - E

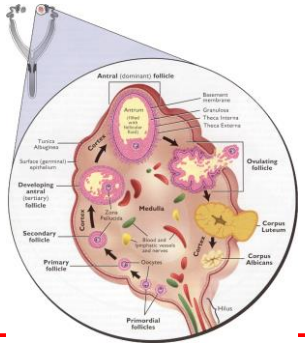


Photo from: Pathways to Pregnancy and Parturition

1º Ovarian Structures

- Primordial follicles
- Primary follicles
- Secondary follicles
- Antral follicles
- Corpora hemorrhagicum – "Bloody Bodies"
- Corpora lutea – "Yellow Bodies"
- Corpora albicantia – "White Bodies"

PHYSIOLOGY: ESTROUS CYCLE

Estrous Cycle

2 major phases:
- Follicular
- Luteal

Estrous Cycle

Follicular Phase
- Regression of CL – Ovulation
- Dominant Structure – Follicle
- Dominant Hormone - Estrogen

Estrous Cycle

Luteal Phase
- Ovulation – Regression of CL
- Dominant Structure – CL
- Dominant Hormone – Progesterone

- Follicles will still grow/ regress but do not ovulate

Estrous Cycle

4 stages:

- Proestrus – Formation of ovulatory follicles + E_2 secretion
- Estrus – sexual receptivity + peak E_2 secretion
- Metestrus – CL formation + beginning of P_4 secretion
- Diestrus – Sustained luteal secretion of P_4

Follicular Phase

Follicular Phase

4 significant events:

- Gonadotropin release
- Follicular preparation for ovulation
- Sexual receptivity
- Ovulation

Follicle Development

- Recruitment
  - Small antral follicles begin to grow and produce E_2
- Selection
  - The antral follicle that has not gone through atresia
- Dominance
  - Follicle continues to grow
  - Levels of E_2 increase
  - Levels of Inhibin increase
- Atresia
  - Degeneration

- Figu

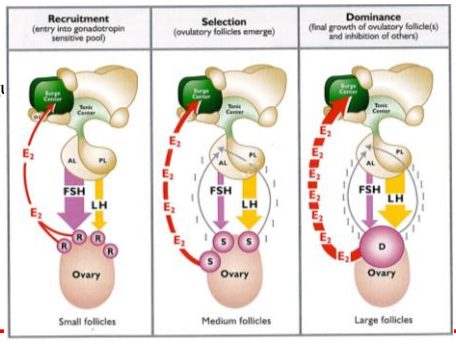


Photo from: Pathways to Pregnancy and Parturition

Follicular Waves

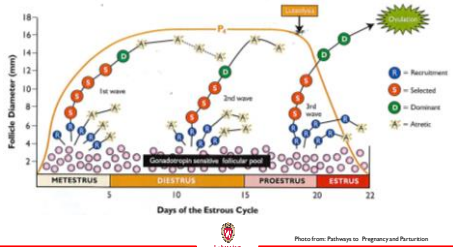


Photo from: Pathways to Pregnancy and Parturition

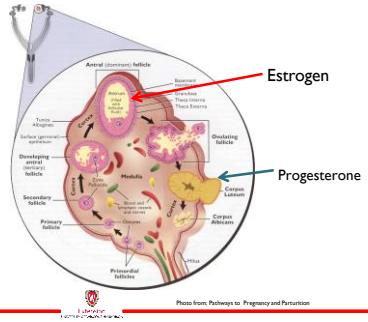
Luteal Phase

Luteal Phase

3 significant events:

- Corpora lutea formation
  - Corpus Hemorrhagicum – Corpus Lutea – Corpus albicans
- Production of progesterone
- Luteolysis

Ovarian Cycle



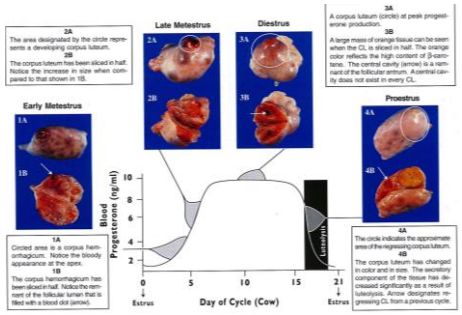


Photo from: Pathways to Pregnancy and Parturition

Estrous Cycle Hormones

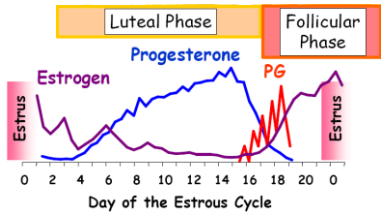
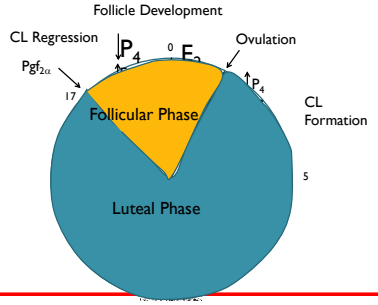
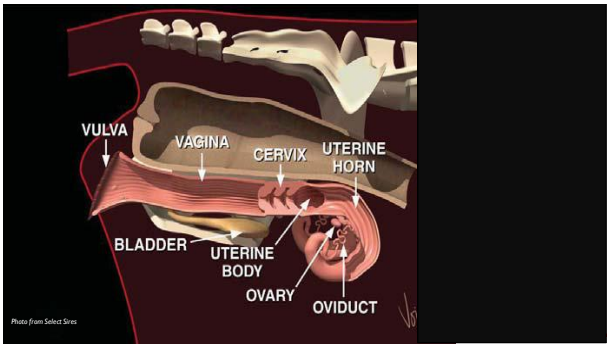


Photo from: Pathways to Pregnancy and Parturition



ARTIFICIAL INSEMINATION TECHNIQUE



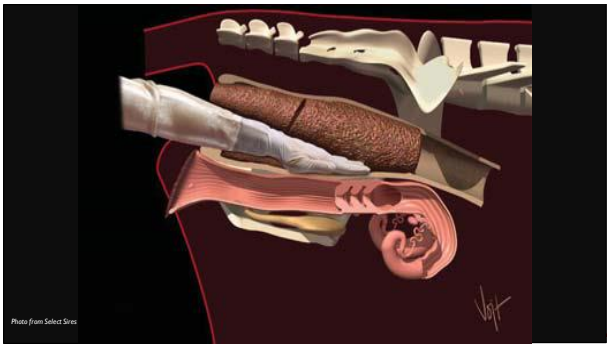


Photo from Select Sires

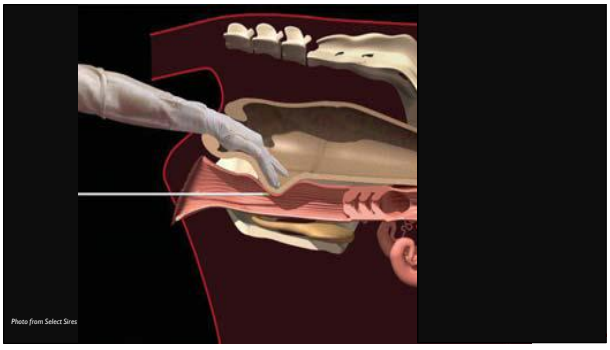


Photo from Select Sires

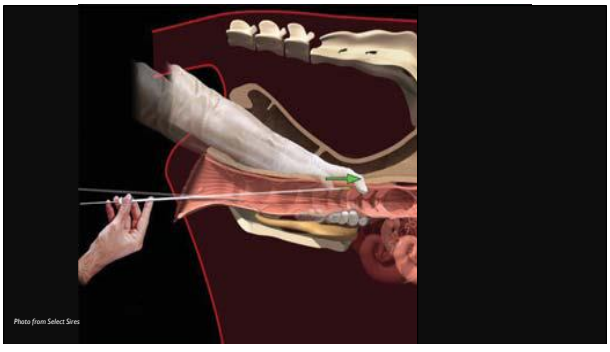


Photo from Select Sires

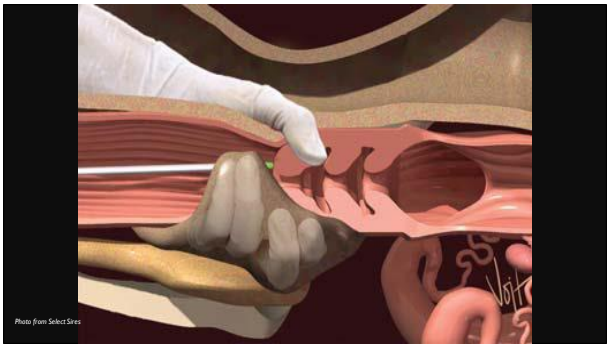


Photo from Select Sires

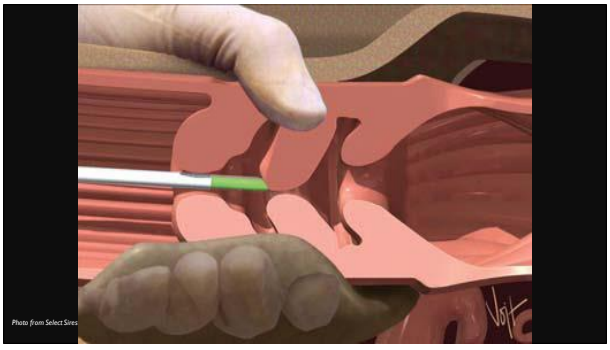


Photo from Select Sires

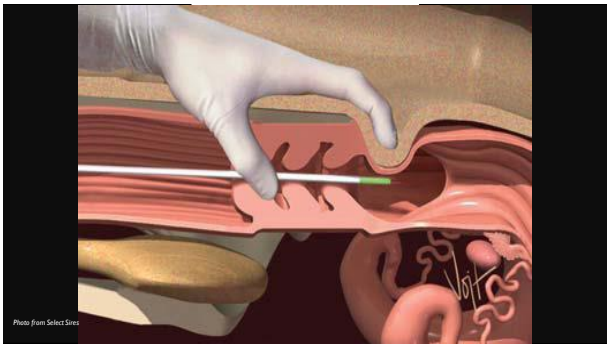
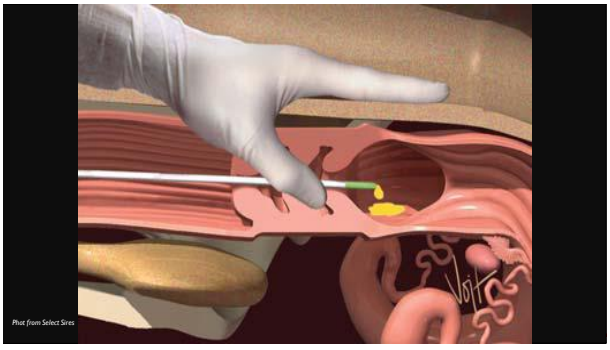


Photo from Select Sires


Phot from Select Sires

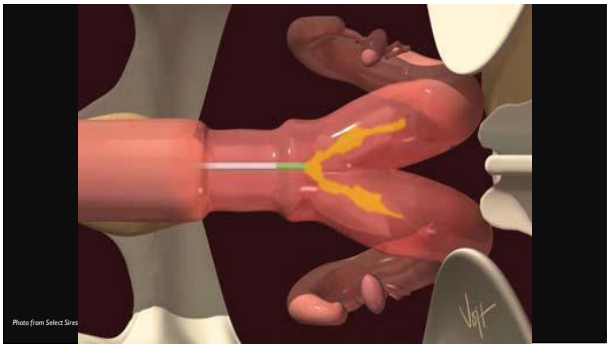


Photo from Select Sires

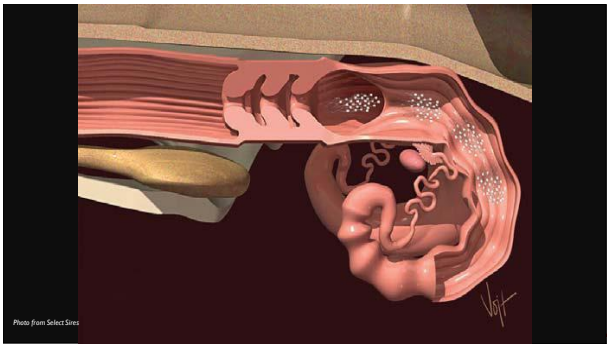


Photo from Select Sires

EQUIPMENT

Bovine Semen Cane

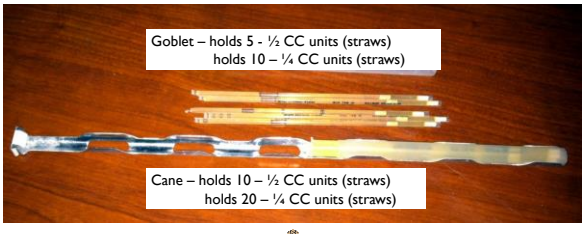


Photo from Katie Pfeiffer,Select Sires

Bovine Semen Straw

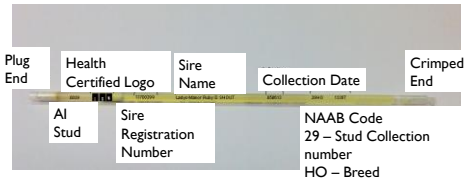


Photo from Katie Pfeiffer,Select Sires

Different Size Straws

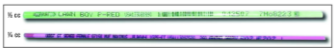


Photo from Katie Pfeiffer

- ¼ CC straws
  - Fertility ↑
  - Better freezing/processing surface
- Universal AI guns can accommodate both straws
  - AI tweezers for ½ CC straws may not tightly grasp ¼ CC straw

AI Kit

- Gun(s)
- Tweezer
- Scissor/Straw cutter
- Long gloves
- Thaw Unit/Thermos with thermometer
- Lube
- Sheaths
- Towels

Photo from Nasco.com

AI Kit Care

- Keep it clean
  - Infections
  - Doesn't function properly
- Keep it stocked
  - Don't want to be in a tough situation

Liquid Nitrogen Tank

- Store in:
  - Dry, well-ventilated space
  - On a board/ off concrete to prevent corrosion
- Liquid Nitrogen
  - Colorless, odorless, and tasteless
  - Can cause frostbite

Photo from allivet.com

Semen Tank

A. Cap
B. Cap rester
C. External shield
D. Neck
E. Lock holder
F. Canister handle
G. Vacuum retention system
H. Index spider
I. Cork
J. Insulation

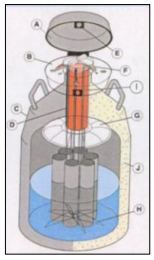
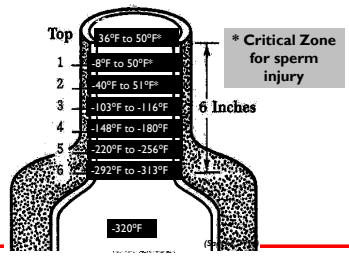


Photo from repcosrvcs.com

Semen Tank



Liquid Nitrogen Tank Care

- Keep an accurate record
  - Cannot count inventory
- Measure liquid nitrogen level
- Keep neck cork tight and free of frost
- If frost forms on neck and cap:
  - Tank has gone bad
  - Semen may be destroyed

HEAT DETECTION

Behavioral Estrus in Dairy Cows

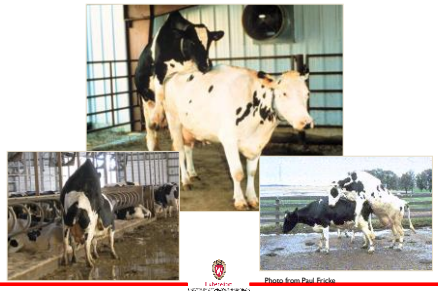


Photo from Paul Fricke

Heat Detection

- Amount needed depends on system selected
- Many females exhibit heat at the same time

Photo from Paul Fricke

Early Signs of Estrus

- Increased locomotion - restless
- Increased phonation - bellowing
- Nervousness
- Attempts to mount other animals
- Very small amount of watery mucus

Not Receptive to the male at this point

Standing Heat

- Stands to be mounted
- Friendly
- Does not eat
- Abundant, more cohesive clear mucus
- Vulva lips red and swollen

Post Estrus

- Will not stand to be mounted
- Will mount other animals
- Dirty flank
- Rough filled tail head
- Bloody discharge

Length of Estrus

Length of Estous Cycle		Duration of Estrus		Time from onset of Estrus to Ovulation	Time from LH Surge to Ovulation
Mean	Range	Mean	Range		
21d	17-24d	15h	6-24h	24-32h	28h

Seasonal Effects of Estrus Expression

	Standing Events	
Breed	Winter	Summer
Holstein	8.6	4.5
Jersey	12.1	5.3

Nebel et al., J Dairy Sci 80(Suppl 1); 1997

When to Detect Heat?

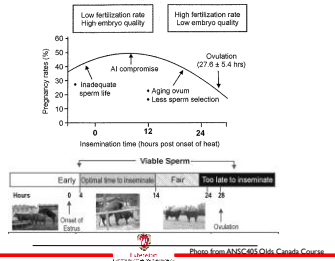
- 70% of standing – 6 pm - 6 am
- 22% of standing – 6 am – noon
- 8% of standing – Noon – 6 pm

Observe twice a day for 30 min
- Early in the morning
- Late at night

Tips to Increase Success

- Assign 1 person
- Id animals properly
- Know the signs of heat
- Record all heat dates
- Schedule adequate time for observation

When to Inseminate



Photos from ANSC405 Olds Canada Course

Video from ANSC405 Olds Canada Course

ESTRUS DETECTION AIDS

Photo from gea.com

Tail Paint

Tail Chalk

Photo from Katie Pfeiffer

Pressure Activated Devices

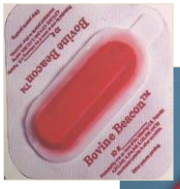
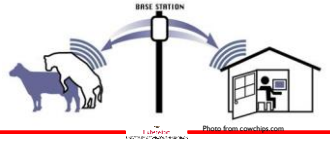


Photo from Katie Pfeiffer

Estrotect Patches

HeatWatch II Estrus Detection System

- Pressure sensitive transmitter glued to tail head
- Signal sent to receiver (within 1.4 mile)



ESTROUS SYNCHRONIZATION

Estrus Synchronization

Why:

- Control when females express estrus
- Bring a group of cows into estrus at the same time
  - Uniform calf crop
- Part of an AI/ET program

Estrus synchronization

Why Continued:

- Establish pregnancy on the 1st day of the breeding season
- Increase number of opportunities to inseminate
  *63 d breeding season = 4 chances

Products for Synchronization

- Prostaglandin Products
  - Lutalyse® Pharmacia Animal Health
  - Lutalyse HighCon
  - ProstaMate® Phoenix Scientific
  - Receptal
  - Estrumate® Schering-Plough
  - EstroPLAN

Photo from allivet.com

Prostaglandin $F_{2\alpha}$

- Produced by the uterus
- Released on Day 17 of cycle when no embryo is present
- Causes regression of the CL
- In cattle, PGF2α will affect a CL from d 5 of cycle to d 17

- Should not be handled by pregnant women

Influence of $PGF_{2\alpha}$ on cycle length

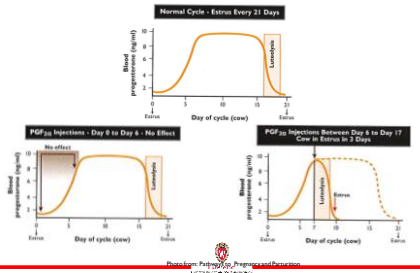


Photo from Pathways to Pregnancy and Parturition

Products for Synchronization

- Progesterone Products
  - Oral: Melengestrol acetate (MGA)
  - Intravaginal: Controlled Internal Drug Release (CIDR)

Photo from animalhealthexpress.com

What do the chemicals do

- Progesterone suppresses –
  - GnRH release
  - Gonadotropin release (LH and FSH)
  - Follicular development and ovulation

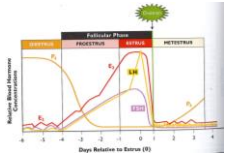


Photo from Pathways to Pregnancy and Parturition

Progesterone

- Prevents the animal from ovulating
- Synchronizes a group of animals
- Can 'jumpstart' anestrous animals into cycling

- If handled by pregnant females could cause you to become "more pregnant"

Blood Progesterone Profiles

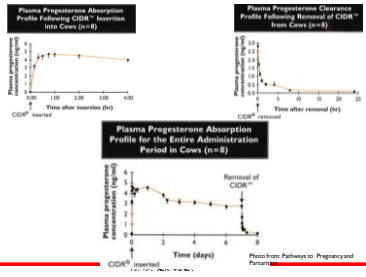


Photo from: Pathways to Pregnancy and Parturition

CIDR vaginal insert

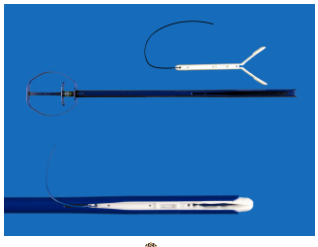


Photo from: Pathways to Pregnancy and Parturition

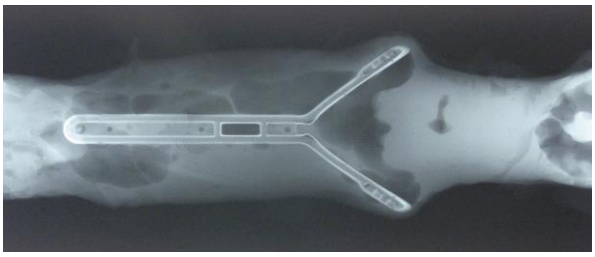


Photo from: Pathways to Pregnancy and Parturition

Products for Synchronization

- Gonadotropin Releasing Hormone – GnRH
  - Cystorelin® Merial
  - Fertagyl® Intervet
  - Factrel® Fort Dodge
  - OvOvalyse
  - GONAbreed

Photo from valleyvet.com

GnRH

- Causes the release of gonadotropins (LH and FSH)
- If dominant follicle (> 10mm) – Ovulation
- If no dominant follicle (< 10mm) – Continued follicular growth
- Can "jumpstart" some anestrous females

Effectiveness of GnRH to induce ovulation

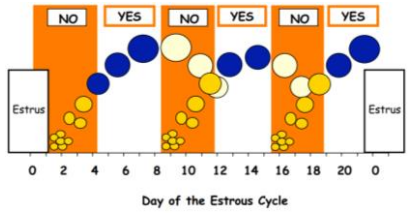
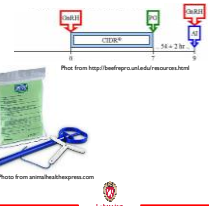


Photo from Joel V. Yelich

Estrous Synchronization Protocols

Photo from allivet.com



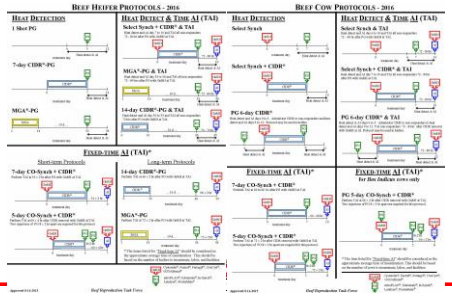
Phot from http://beefrepro.unl.edu/resources.html

Photo from animalhealthexpress.com

Photo from valleyvet.com

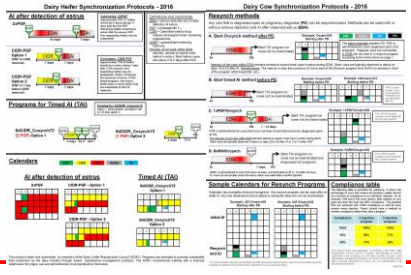
Beef Protocols

http://beefrepro.unl.edu/resources.html



http://www.dcrcouncil.org/protocols.aspx

Dairy Protocols



Which Protocol?

Determine potential results and costs
- Select the best system for YOUR situation

Advantages and tradeoffs must be weighed in terms of:
- Cost
- Time
- Facilities
- Labor Requirements
- Cows

Common Misconceptions:

- Synchronization Protocols are Not Miracle Drugs
  - Base Your Program on Realistic Expectations
  - Most Misconceptions Occur From Misinformation About What Drugs Can and Cannot Do

Misconception 1

- You Can Breed Cows Earlier After Calving
  - Prostaglandin Does Not Cause Cows to Come Into Heat Sooner After Calving
  - Cows Must Go Through a Normal Recovery Period and Begin Cycling Before Drugs Will be Effective

Misconception 2

- You Won't Have to Heat Detect
  - Only Works When You Select a Fixed Time Insemination Program

Misconception 3

- By Breeding Cows in a Short Interval, They Will Calve in an Equally Short Interval
  - This is Incorrect
  - Cattle Inseminated on the Same Day Have a Calving Range of ± 10 Days From the Calving Due Date

Tools to help with Synchronization

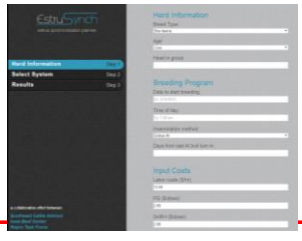
- Estrus Synchronization Planner:
  - http://www.iowabeefcenter.org/estrussynch.html

Tools to Help with Synchronization

- Management Minder
  - http://cowweb.exnet.iastate.edu/CowWeb/faces/

Tools to Help with Synchronization

- Estrussynch.com – Web based program



BULL SELECTION

Why Genetics is important

Nutrition – Cow Comfort -- Genetics

High marbling

Environment allows expression of Genes

Phenotype vs. Genotype

- Phenotype: External expression of traits
- Genotype: Genetic composition that determines phenotype

They are not always 1:1

$P = G + E$

Genotype is affected by **Environment**

Inheritance

- Transmission of traits from parents to offspring
- Genes
  - Basic unit of heredity
  - Functionally defined as a segment of a chromosome that directs synthesis of a specific protein
- Chromosomes
  - Mixture of genetic material and proteins

Heritability

- The proportion of phenotypic variation that is due to genotype
- Extent to which a phenotypic trait is under genetic control
- Varies from 100% to 0%

Examples of heritability

Trait	Heritability
Stature	0.42
Strength	0.31
Milk yield	0.30
Udder traits	0.25 to 0.28
Feet/leg traits	0.15 to 0.21
SCC	0.10

Traits < 0.10 are too low to improve easily directly
1. Influence of environment
2. Low genetic variability among animals

Repeatability (Reliability)

- Estimate of degree to which measures repeat themselves; **consistency of repetition**
- Ranges from 0 – 99%
- The higher the repeatability, the more data

Selection

- Process of identifying who will become parents
- The only practical means to genetic improvement
- Expression of a trait is a combination of genetics and environment

Identifying Animals

- Tags
- Tattoos
- Brands
- DNA

Selecting Sires

- What are your goals?
  - Select sires that will improve performance toward goal
  - Start with an animal that is close

Selecting Sires

- The majority of genetic progress comes from sire selection
  - NS sire produces 30-40 calves/ year
  - AI sire produces hundreds of calves
- Accuracy is important!
  - What is your sample size?
  - Bulls have more accurate EPDs/PTAs than cows

Sire Summaries

- Published by:
  - Breed Associations
  - Bull Studs
  - National Association of Animal Breeders
- Data is collected by registered breeders
- EPDs and PTAs are calculated by universities or breed association geneticists

Expected Progeny Differences (EPDs)

- Predict the genetic quality of future offspring
- The degree of difference between the progeny of the bull and the progeny of the average bull of the breed
- Given as a plus or minus value.

EPDS

- EPD for yearling weight of +65
  - Progeny should average 65 pounds more at 365-days of age
- Larger numbers are not always better, depends on the trait you are looking at

Predicted Transmitting Ability (PTAs)

- Value that predicts the performance of future offspring relative to the population mean
- Ex. Daughters of a bull with a PTA of 2000 lbs for milk is expected to produce 200 lbs more milk than the daughters of a bull with a PTA of 1800 lb for milk

EPD Example 1

- Bull A has a CED score of _____
- Bull B has a CED score of _____

- What does CED stand for?

- Which bull would you select if this was a trait you were interested in?

EPD Example 2

Bull A
- BW = _____
- YW = _____
- MM = _____

Bull B
- BW = _____
- YW = _____
- MM = _____

If you are looking for a bull that has good calving ease and has daughters that are able to produce enough milk to feed these calves, which bull would you select and why?

PTA Example 1

- Bull A has a DPR score of _____
- Bull B has a DPR score of _____

- What does DPR stand for?

- Which bull would you select if this was a trait you were interested in?

PTA Example 2

Bull A
- Milk = ___
- Fat = ___
- Protein = ___

Bull B
- Milk = ___
- Fat = ___
- Protein = ___

If you are looking for a bull that has daughters with good fat and protein production, which bull would you select and why?

COST ASSOCIATED WITH AI

Cost of AI

- Drug Cost/ Head: $15
- Pregnancy Rate: 50%
- Required workings: 3
- Semen Cost/ Straw: $25
- Technician Cost/ Head: $20

# of Cows	100
Pregnancy Rate (Cows)	90%
# of Heifers	15
Pregnancy Rate (Heifers)	85%
Avg weaning weight of calves	575 lbs
Bulls required for NS	5
Avg Purchase price of bulls	$2,750/ head
Salvage value of bulls	$1,700/ head
Useful life of bull	3 yrs
Annual bull maintenance expense	$650/ head

Bull Cost

	$/bull	Total for 5 bulls
Annual ownership cost: (2,750-1,700)/3	$350	$1,750
Annual Maintenance Cost	$650	$3,250
Risk of bull loss: 0.2[($2,750 + $1,700)/2]	$445	$2,225
Total Cost	$1,445	$7,225

Total cost of AI

	$/head	$/115
Drug Costs	$15	$1,725
Semen Cost	$25	$2,875
Technician Fees	$20	$2,300
Additional Labor		$480
Total cost		$7,380

Gains from AI?

- Genetically superior sires increases average weaning weight by 25lbs/ head
- 25lbs x ($130/ 100lbs) = $32.50/ head extra
- Total Calves = 102.75
- Overall increase: $3,339

Gains from AI?

- Better management practices results in 5% more calves
- (.05) x 115 = 5.75 more animals
- 5.75 x 575 lbs/ head = 3306.25 lbs
- 3306.25 lbs x $130/ cwt = $4,298

Gains from AI?

- Increased weight: $3,339
- Increased calves: $4,298
- Total increased revenue: $7,637

Gains from AI?

- AI + NS reduces # of bulls needed
- Lowers bull ownership/ maintenance fee by $1,445
- Reduced cull bull sales: $567

Is AI worth it?

- Cost of AI:
  $7,380 + $567 = $7,947
- Gains from AI:
  $7,637 + $1,445 = $9,082
- Change in Revenue: + $1,135

PREGNANCY DETECTION

Sandy Stuttgen, DVM
Agriculture Educator
Extension Taylor County

Special Thanks to:
Paul Fricke, Dairy Reproduction Extension Specialist , UW-Madison
Zen Miller, Dairy/Livestock Agent, UW-Extension, Outagamie County

Why Do We Preg Check?

- Reduce Feed Cost
- Tighten Calving Season
- Tighten Calving Interval
- Return To Service
- Confirm For Sale
- Determine non-pregnancy

Why Nonpregnancy Diagnosis?

The key to early nonpregnancy diagnosis is to couple:

1. identification of open cows with
2. a strategy to rapidly return these cows to an AI service

Good News for Repro

University researchers have discovered a substance that has been scientifically proven to improve reproduction when infused into the uterus

Semen

Methods of Directly Determining Pregnancy Status

- Direct detection of the tissues and/or associated fluids of the conceptus either manually or via electronic instrumentation
- **A brief history of direct methods for non-pregnancy diagnosis…**

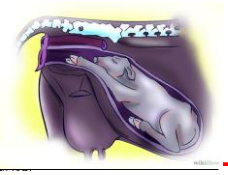
Wait and See

Gestation Length

Holsteins: ~282 d; ~9 mo

Calf Bumping

Accurate beginning
~180 to 210 d after AI
~6 to 7 mo



Return to Estrous

21d cycle, range 17-24 d

"Estrus" or "Heat" Ave 12-24 hrs duration

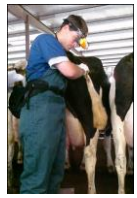
- Ovulation occurs ~12 hrs after standing estrus
- Best AI results end of estrus ~12 hrs before ovulation
- OR 12-18 hrs after first standing event

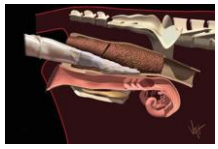
Attributes of the "Ideal" non-pregnancy test

- Sensitive – correctly identify pregnant cows
  pregnancy predictive value
- Specific – correctly identify open cows
  non-pregnancy predictive value
- Inexpensive
- Simple to conduct under on-farm conditions
- Able to determine pregnancy status at the same time the test is administered

Veterinary Palpation/Ultrasound

- Predict Calving Time, diagnose uterine & ovarian pathology
- Cost: hourly charge, trip charge
- Client-Vet Relationship





Transrectal Palpation

Accurate beginning
~35 d after AI

Membrane Slip from 30 days to term, connective tissue of the lesser curvature of the chorioallantoic membrane is felt as it passes between the examiner's finger and thumb. The fingers and thumb should always be flattened, not pinching the fetal membranes…
Morrow, David A. 1986. *Current Therapy in Theriogenology 2*

Palpation of the Amniotic Vesicle
Wisnicky W, Cassida LE. 1948. *A manual method for diagnosis of pregnancy in cattle.* J. Am. Vet. Med. Assoc. 113:451.

Transrectal Ultrasound

Accurate beginning
~30 d after AI

Accuracy of transrectal ultrasonography (TU) for determination of pregnancy status 27 d after timed AI

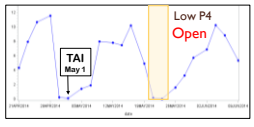
Silva et al., J. Dairy Sci. 90:4612-4622;2007

Sensitivity[1] % (no./no.)	Specificity[2] % (no./no.)	PPV[3] % (no./no.)	NPV[4] % (no./no.)	Accuracy[5] % (no./no.)	Kappa
96.5 (603/625)	93.4 (979/1048)	89.7 (603/672)	97.8 (979/1001)	94.6 (1582/1673)	0.87

[1]Proportion of pregnant cows with a positive TU outcome.
[2]Proportion of not-pregnant cows with a negative TU outcome.
[3]Proportion of cows diagnosed pregnant using TU that truly were pregnant.
[4]Proportion of cows diagnosed as not-pregnant using TU that truly were not-pregnant.
[5]Proportion of pregnancy status, pregnant and not-pregnant, that was correctly classified by TU.

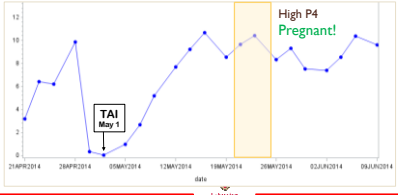
Methods of Indirectly Determining Pregnancy Status

- Qualitative or quantitative measures of reproductive hormones at specific stages after AI
- Detection of conceptus specific substances in maternal body fluids



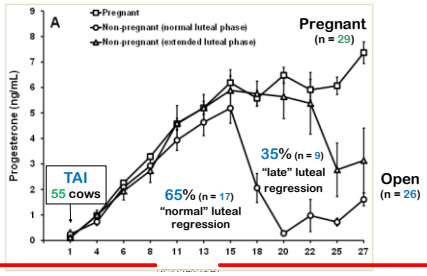
PROGESTERONE

20 to 24 d after AI
<1 month in gestation



Giordano et al., 2012

J. Dairy Sci. 95:683-697



BIOLOGY OF REPRODUCTION 26, 925–933 (1982)

Detection and Partial Characterization of Two Bovine Pregnancy-Specific Proteins[1,2]

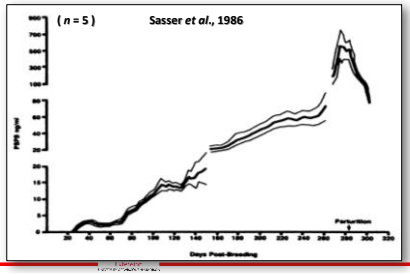
J. E. BUTLER,[3] W. C. HAMILTON,[4] R. G. SASSER,[4] C. A. RUDER,[4] G. M. HASS[5] and R. J. WILLIAMS[4]

Department of Animal Science[4] and Department of Bacteriology and Biochemistry[5] University of Idaho Moscow, Idaho 83843

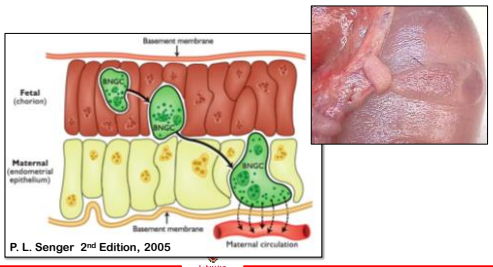
Pregnancy-specific protein A was identified as α-fetoprotein.

Pregnancy-specific protein B (PSPB) had no immunological cross-reactivity with the known proteins or organ extracts which were tested. PSPB = a novel pregnancy marker produced by the bovine conceptus.

PSPB Concentrations in Pregnant Dairy Cows



Pregnancy-Associated Glycoproteins



Collect 2.5 cc blood, Red Top Tube

Overnight Express

Next Morning, Arrive at the lab

That afternoon, results emailed back to farm

Time from sample collection to receive outcomes: ~36 h

What Are Our Choices…

- BioPRYN – BioTracking, LLC, Moscow, ID
  http://www.biotracking.com/
- DG 29 – Conception Animal Reproduction Technologies, Beaumont, QC
  http://www.conception-animal.com/test_an.html
- IDEXX Bovine Pregnancy Test
  IDEXX Laboratoires, Inc.k Westbrook, ME,
  http://www.idexx.com/view/xhtml/en_us/livestock-poultry/ruminant/lpd-bovine-pregnancy-test.jsf

BioPRYN

Cow 90 days post calving, 30 day post breeding, 2-5 ml blood
Pregnancy Specific Protein –B(PSPB)

Waupun Vet Service Lab – 920-324-3831
- Cost $2.40 Test + .80 Tube Needle = $3.20 Plus Shipping
- Can Do Johnes BVD & PG From Same Sample $12.65
- - East Central Select Sires Will Draw Blood

Dairy Pharm & Diagnostic Services
Fredrick, WI – 715-653-2201
- Cost $2.95 + tube + needle + shipping

Kenyon Veterinary Clinic – 507-789-6118
Kenyon, MN

bio TRACKING

- **Blood ELISA**
- **40 affiliate labs in the US**
- **Independently owned**
- **28 to 30 d after AI**
- **$2.40 to $2.75 per sample** (cost of test only)
- **Volume discounts**

Conception Test/DG-29

Ag Source, Menominee – 715-235-1128
www.CRInet.com

Cows 90 days Post Calving - 30 days Post Breeding
2-5 ml. Blood

Time Frame – Draw & Mail Day 1
Lab Time – 1 Day
PG – Yes/No
Plus Low Levels Show Possible Embryo Loss

DG29: Blood ELISA

Complete Kit
- test analysis, blood tubes, needles, needle holder, shipping containers, shipping costs included

Pricing
- 24 tests: $3.54/test
- 48 tests: $3.44/test
- 72 tests: $3.38/test
- 144 tests: $3.30/test

Test Only Pricing
- 48 tests: $3.08/test
- 72 tests: $2.79/test
- 144 tests: $2.64/test
- 288 tests: $2.50/test

IDEXX LABORATORIES

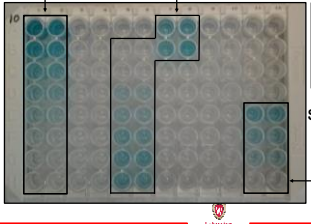
IDEXX Bovine Pregnancy Test

- Blood ELISA
- $2.50 to $3.50 per test (cost of test only)

Standard Curve
1:2 serial dilutions of serum from a pool of 5 cows > 150 d pregnant

Pregnant Cow
Serial samples from Day 20, 22, 25, 27, 29, 32, 34, 36, & 39 after TAI

IDEXX
Visual Read Pregnancy Test



Announced September, 2013

$336 for 192 wells
= $1.75/well

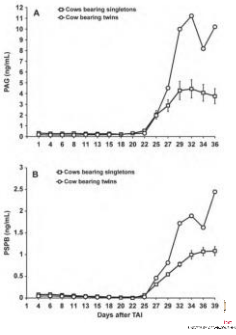
Positive and Negative Controls

Accuracy of PAG ELISA for determination of pregnancy status 27 d after timed AI

Silva et al., J. Dairy Sci. 90:4612-4622;2007

Sensitivity[1] % (no./no.)	Specificity[2] % (no./no.)	PPV[3] % (no./no.)	NPV[4] % (no./no.)	Accuracy[5] % (no./no.)	Kappa
95.4 (596/625)	94.2 (987/1048)	90.7 (596/657)	97.1 (987/1016)	94.6 (1583/1673)	0.89

[1]Proportion of samples from pregnant cows with a positive PAG ELISA.
[2]Proportion of samples from not-pregnant cows with a negative PAG ELISA.
[3]Proportion of PAG ELISA with a pregnant outcome that truly were pregnant.
[4]Proportion of PAG ELISA with a not-pregnant outcome that truly was not-pregnant.
[5]Proportion of pregnancy status, pregnant and not-pregnant, that was correctly classified.



#Twins

Giordano et al., 2012
J. Dairy Sci. 95:683-697

Pregnancy loss is 3-fold greater for cows with twins vs. singletons

Blood Testing Conclusions

- 95% Accurate at 30 Days Post Breeding
- Use of a commercial PAG assay for detecting non-pregnant cows 27 d after AI
  - yielded acceptable sensitivity and specificity and had a high negative predictive value
  - had a similar accuracy when compared to transrectal ultrasonography
- Commercial PAG and PSPB tests may more reliably detect cows undergoing pregnancy loss compared to use of ultrasound when conducted before 30 d after AI
- Initiation of resynchronization 25 d after an initial TAI resulted in similar fertility to initiation of resynchronization 32 d after TAI in lactating Holstein cows thereby decreasing DIM at TAI and total days open after the initial TAI

IDEXX Milk Pregnancy Test

- Measures PAGs in milk, expand use of DHI milk testing
- High sensitivity and specificity from 60 days post calving and 35 days post AI
- Available from IDEXX Lab

contact by calling 1-888-433-9987

Near Detroit, MI: 1400 S. Telegraph Road
Bloomfield Hills, MI 48302

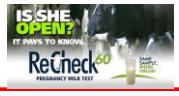
Near Minneapolis: 4801 West 81st Street, Suite 102
Bloomington, MN 55437

IDEXX Introduces Milk-based Bovine Pregnancy Test That Simplifies and Streamlines Pregnancy Diagnosis in Dairy Cattle [Trade]

The first of its kind, the IDEXX milk-based test optimizes reproductive efficiency and helps milk recording laboratories expand their services

WESTBROOK, Maine, October 18, 2012—At the recent World Dairy Expo in Madison, Wisconsin, IDEXX announced the launch of the IDEXX Milk Pregnancy Test, the first milk-based test for detecting pregnancy as a means of optimizing reproductive efficiency in dairy herds. The ELISA-format test detects pregnancy-associated glycoproteins (PAGs) to determine pregnancy status while minimizing animal handling. With a high level of sensitivity and specificity from ≥35 days postbreeding and ≥ 60 days postcalving, producers can work with dairy herd improvement (DHI) organizations to get early, accurate confirmation of open cows in less than 3.5 hours.

"Expanding the use of DHI milk samples to include confirmation of pregnancy is a simple, cost-effective way for producers to increase the efficiency of their total operation," says Olivier te Boekhorst, VP General Manager, IDEXX Livestock and Poultry Diagnostics. "At the same time, the IDEXX Milk Pregnancy Test also helps recording laboratories make their herd health management programs more attractive to their customers."



- **DHIA laboratories**
- **MSRP: $3.50 per sample**
- **Range: $3.00 to $5.00**

J. Dairy Sci. 98:1–13
http://dx.doi.org/10.3168/jds.2014-8974

Factors associated with pregnancy-associated glycoprotein (PAG) levels in plasma and milk of Holstein cows during early pregnancy and their effect on the accuracy of pregnancy diagnosis

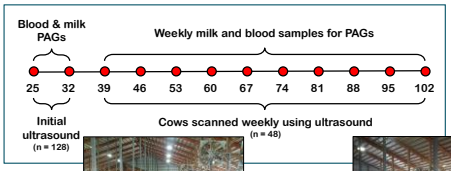
A. Ricci,*† P. D. Carvalho,* M. C. Amundson,* R. H. Fourdraine,‡ L. Vincenti,† and P. M. Fricke*1
*Department of Dairy Science, University of Wisconsin–Madison, Madison 53706
†Department of Veterinary Science, Università di Torino, Grugliasco 10090, Italy
‡AgSource Laboratories, Menomonie, WI 54751

Compared IDEXX blood and milk tests
PAG levels in plasma and milk were associated with:

- **stage of gestation**
- **parity (1st lactation vs. older cows)**
- **pregnancy loss**
- **milk production**

Experimental Design

Ricci et al., 2015



Accuracy of PAG blood and milk ELISA for pregnancy status 32 d after timed AI

Ricci et al., 2015

	Sensitivity[1] % (no./no.)	Specificity[2] % (no./no.)	PPV[3] % (no./no.)	NPV[4] % (no./no.)	Accuracy[5] % (no./no.)
Plasma	100 (57/57)	87 (73/84)	84 (57/68)	100 (73/73)	92 (130/141)
Milk	98 (52/53)	83 (68/82)	79 (52/66)	99 (68/69)	89 (120/135)

[1]Proportion of samples from pregnant cows with a positive PAG ELISA.
[2]Proportion of samples from not-pregnant cows with a negative PAG ELISA.
[3]Proportion of PAG ELISA with a pregnant outcome that truly were pregnant.
[4]Proportion of PAG ELISA with a not-pregnant outcome that truly were not-pregnant.
[5]Proportion of pregnancy status, pregnant and not-pregnant, that were correctly classified.

Results

- Overall, 42% (57/137) of synchronized cows were diagnosed pregnant 32 d after TAI.
- 2 cows were diagnosed with twins 32 d after TAI, and these cows were removed from all subsequent analyses.
- The incidence of pregnancy loss for cows diagnosed with singleton pregnancies was 13% (7/55).

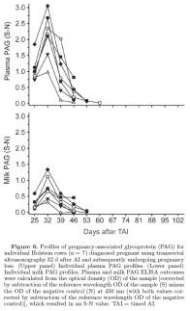
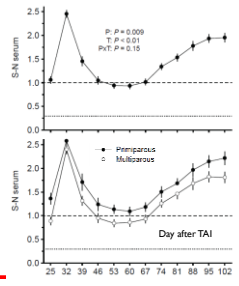
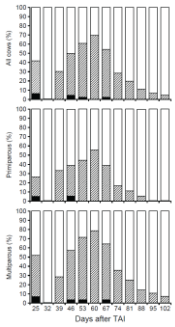


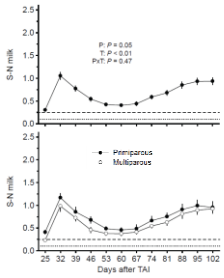
Figure 6. Profiles of pregnancy-associated glycoprotein (PAG) for individual Holstein cows (n = 7) diagnosed pregnant using transrectal ultrasonography 32 d after AI and subsequently undergoing pregnancy loss. (Upper panel) Individual plasma PAG profiles. (Lower panel) Individual milk PAG profiles. Plasma and milk PAG ELISA outcomes were calculated from the optical density (OD) of the sample [corrected by subtraction of the reference wavelength OD of the negative control (N) at 450 nm (with both values corrected by subtraction of the reference wavelength OD of the negative control)], which resulted in an S:N value. TAI = timed AI

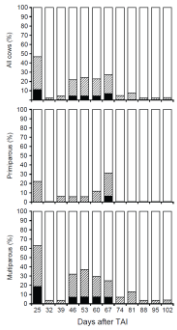
Plasma PAGs





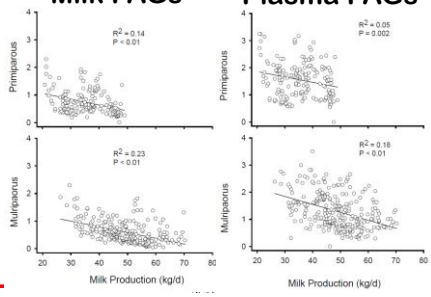
Milk PAGs





Milk PAGs

Plasma PAGs



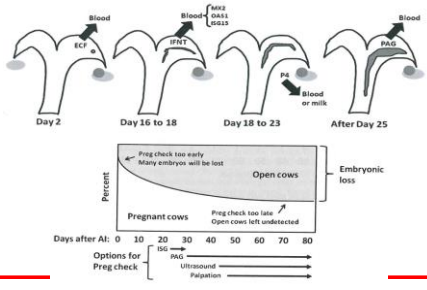
Blood vs. Milk: Which is Better?

- The sensitivity of both the blood and the milk PAG tests are acceptable around 32 d and after ~74 d after AI, but not from 39 to 67 d.
- Costs of blood and milk PAG tests are competitive with palpation and ultrasound.
- Use of either of these tests to diagnose pregnancy status 32 d after AI would economically benefit a dairy farm.
- Choice comes down to management.
  - Preg check interval is the most important consideration

Conclusions

- Stage of gestation, parity, pregnancy loss, and milk production were associated with plasma and milk PAG levels after TAI similarly.
- Based on plasma and milk PAG profiles, the optimal time to conduct a first pregnancy diagnosis is ~32 d after AI coinciding with an early peak in PAG levels of pregnant cows.
- Because of the occurrence of pregnancy loss, all pregnant cows should be retested >74 d after AI.

In Summary



Outcomes

* Days post AI	Pregnant	Recheck	Non-Pregnant
Visual return to estrous	Does not return to heat until after calves	Does not return to heat every 21 days	Returns to heat every 21 days
Progesterone assay		High P4 on day 23	Low P4 on day 23
Rectal palpation	Fetus day 50 -60	CL, membrane slip/amniotic vesicle day 35-40	No conceptus day 35-40, no CL, developing follicle
Ultrasound	Fetal sex day 58	Amniotic vesicle/fetal heartbeat day 30	No conceptus day 30, no CL, developing follicle
Blood PAG	Positive day 74	Positive day 32 False negative w/ high milk production	Negative day 32
Milk PAG	Positive day 74	Positive day 33-39 False negative w/ high milk production	Negative day 33-39
Blood or Milk PAG		False positive: < 60 days since last pregnancy False negative: blood: 53-60 days milk: 46-67 days	

Questions?

- An appropriate method for determining pregnancy status depends on the objective of the reproductive program and considerations that are unique to each individual farm
- Work with your veterinarian & genetics company to create the best reproductive program for your farm

Thank you

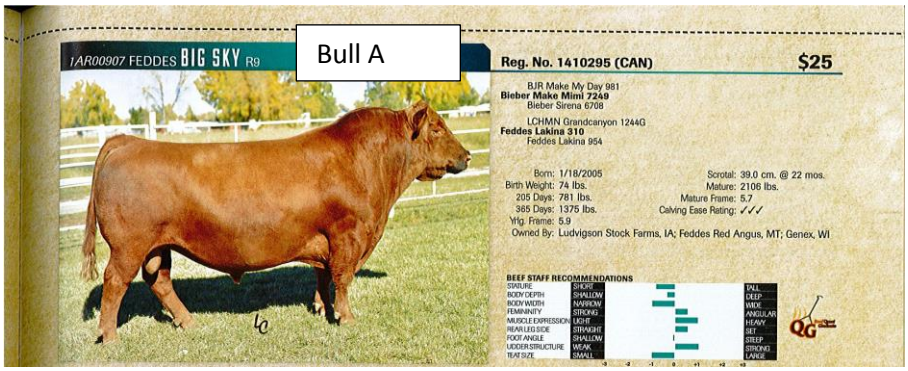
Sandy Stuttgen
Extension Taylor County
715-748-3327
Sandra.stuttgen@wisc.edu

Heather Schlesser
Extension Marathon County
715-261-1230 x 2
Heather.schlesser@wisc.edu

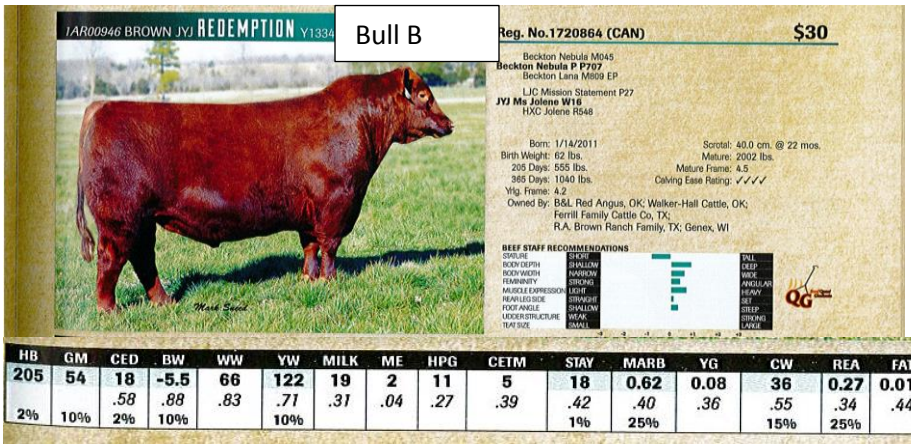
EPD Interpretation Activities:

Use the following sire summaries to answer the questions below.

Example 1:



HB	GM	CED	BW	WW	YW	MILK	ME	HPG	CETM	STAY	MARB	YG	CW	REA	FAT
137	52	5	-4.5	60	82	26	7	20	-1	13	0.67	-0.16	11	0.42	-0.030
		.93	.95	.94	.94	.92	.70	.75	.92	.57	.70	.53	.61	.67	.67
25%	20%		15%			20%		1%		15%	20%	3%		10%	10%

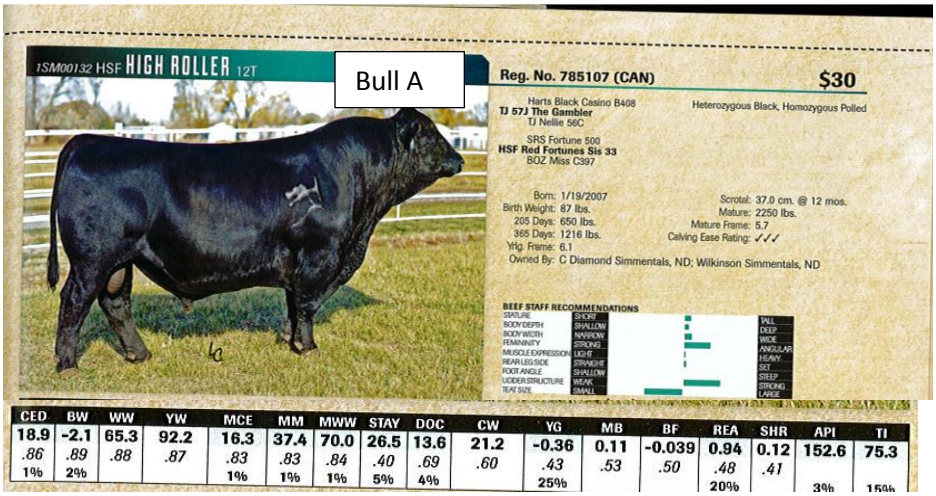


HB	GM	CED	BW	WW	YW	MILK	ME	HPG	CETM	STAY	MARB	YG	CW	REA	FAT
205	54	18	-5.5	66	122	19	2	11	5	18	0.62	0.08	36	0.27	0.010
		.58	.88	.83	.71	.31	.04	.27	.39	.42	.40	.36	.55	.34	.44
2%	10%	2%	10%		10%					1%	25%		15%	25%	

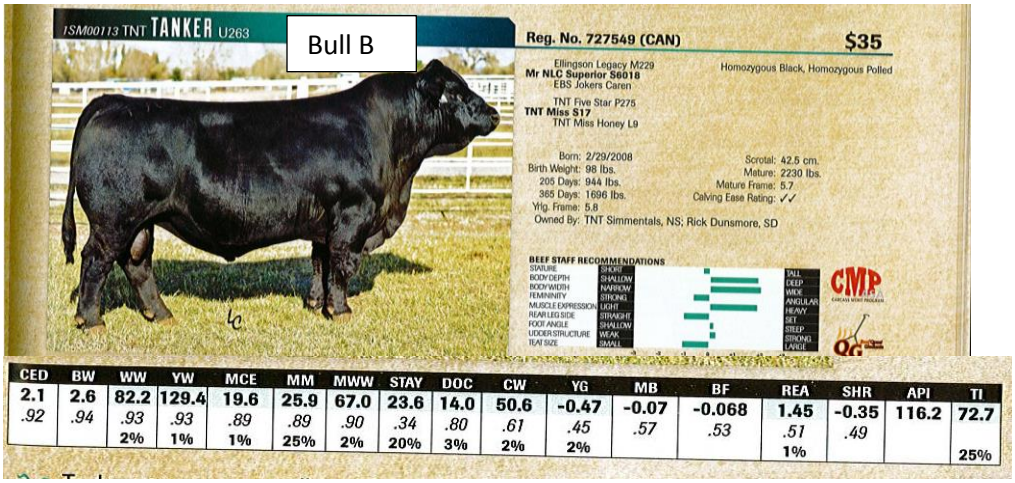
What does CED stand for?

Which bull would you select if this was a trait you were interested in?

Example 2:



CED	BW	WW	YW	MCE	MM	MWW	STAY	DOC	CW	YG	MB	BF	REA	SHR	API	TI
18.9	-2.1	65.3	92.2	16.3	37.4	70.0	26.5	13.6	21.2	-0.36	0.11	-0.039	0.94	0.12	152.6	75.3
.86	.89	.88	.87	.83	.83	.84	.40	.69	.60	.43	.53	.50	.48	.41		
1%	2%			1%	1%	1%	5%	4%		25%			20%		3%	15%



CED	BW	WW	YW	MCE	MM	MWW	STAY	DOC	CW	YG	MB	BF	REA	SHR	API	TI
2.1	2.6	82.2	129.4	19.6	25.9	67.0	23.6	14.0	50.6	-0.47	-0.07	-0.068	1.45	-0.35	116.2	72.7
.92	.94	.93	.93	.89	.89	.90	.34	.80	.61	.45	.57	.53	.51	.49		
		2%	1%	1%	25%	2%	20%	3%	2%	2%			1%			25%

Complete the following chart:

Bull A	Bull B
BW =	BW =
YW =	YW =
MM =	MM =

If you are looking for a bull that has good calving ease and has daughters that are able to produce enough milk to feed these calves, which bull would you select and why?

EPD TERMINOLOGY

EPD: *Expected Progeny Difference* – The expected differences in performance of a sire's progeny when compared to the average progeny of all sires evaluated within the breed. Based on actual performance, progeny performance and relatives' performance.

ACC: *Accuracy* – The reliability placed on the EPD.

CE, CED: *Calving Ease Direct* – The difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers.

BW: *Birth Weight* – The birth weights of a bull's progeny when compared to the breed average, in pounds.

WW: *Weaning Weight* – The adjusted weaning weights of a bull's progeny when compared to the breed average, in pounds.

YW: *Yearling Weight* – The adjusted yearling weights of a bull's progeny when compared to breed average, in pounds.

UDDR: *Udder Suspension* (Hereford) – Differences in sire EPDs predict the difference expected in the sires' daughters udder characteristics when managed in the same environment. Weak udder suspension results in pendulous udders that make it difficult for a calf to nurse.

TEAT: *Teat* Size (Hereford) – Differences in sire EPDs predict the difference expected in the sires' daughters udder characteristics when managed in the same environment. Oversized teats are difficult for newborn calves to nurse and the calf may not receive adequate colostrum.

RADG: *Residual Average Daily Gain* (Angus) – The adjusted amount of post weaning gain in future progeny, in pounds, given a constant amount of feed consumed.

SCR, SC: *Scrotal Circumference* (Angus, Charolais, Hereford) – The adjusted yearling scrotal circumferences of a bull's progeny when compared to breed average, in centimeters.

DOC (Angus) – The difference in yearling cattle temperament, with a higher value indicating more favorable docility.

CETM, CEM, MCE: *Calving Ease Total Maternal, Calving Ease Maternal, Maternal Calving Ease* – The difference in percentage of unassisted births with a higher value indicating greater calving ease in first-calf daughters.

Milk, MM: *Maternal Milk* – The amount of pre-weaning performance gained by calves which can be attributed to the milking ability of a bull's daughters, expressed in pounds of calf.

TM, MWW: *Total Maternal, Maternal Weaning Weight* (Red Angus, Simmental, Charolais) – Measure of a sire's ability to transmit milk production and growth rate through his daughters. Predicts the weaning weight of a sire's daughters' calves. Equal to his milk EPD plus half his WW EPD.

M&G: *Maternal Milk & Growth* (Hereford) – The Milk EPD plus half the WW EPD. A sire's M&G EPD reflects what he is expected to transmit to his daughters for a combination of growth genetics and maternal production.

ME: *Maintenance Energy* (Red Angus) – Differences in mature cow maintenance energy requirements. Expressed as megacalories per month.

HPG, HP: *Heifer Pregnancy* (Red Angus, Angus) – Differences in percent probability of female progeny conceiving to calve as 2-year-olds; a more accurate measurement than her sire's or paternal brothers' scrotal circumference.

MkH: *Milking Herds* (Angus) – Indicates the number of herds from which daughters are reported.

MkD: *Milking Daughters* (Angus) – Reflects the number of daughters having progeny weaning weight records included in the analysis.

MW: *Mature Weight* (Angus) – A predictor of the difference in mature weight of a sire's daughters compared to the daughters of other sires, expressed in pounds.

MH: *Mature Height* (Angus) – A predictor of the difference in mature height of a sire's daughters compared to daughters of other sires, expressed in inches.

STAY: *Stayability* (Red Angus, Simmental) – Differences in percent probability of daughters staying productive past the age of six.

CW: *Carcass Weight* (Angus, Simmental, Charolais, Red Angus) – The adjusted carcass weights of a sire's progeny, expressed in pounds.

MB, MARB, IMF: *Marbling* – A predictor of the difference in a sire's progeny for percent marbling score or percent intramuscular fat in the ribeye muscle compared to other sires.

YG: *Yield Grade* (Simmental) – Expressed as a deviation of Yield Grade units where negative values are desirable.

REA, RE: *Ribeye Area* – Adjusted ribeye area of a sire's progeny, measured in square inches.

FAT, BF: *Back Fat* – The adjusted twelfth rib fat thickness of a sire's progeny, expressed in inches.

SHR: *Shear Force* (Simmental) – Pounds of force required to shear a steak.

Carc H/P and Ult H/P: Group/progeny (Angus) – Reflects the number of contemporary groups and the number of carcass and ultrasound progeny included in the analysis.

I: *Interim* – The EPD is based on performance information of a bull's sire, dam and relatives.

P: Pedigree estimate.

$EN: *Cow Energy Value* (Angus) – Assesses differences in cow energy requirements as an expected dollar savings difference in daughters of sires, expressed in dollar savings/cow/year. A larger value is more favorable when comparing two animals. $EN savings include lactation energy requirements and energy costs associated with differences in mature cow size.

PTA Interpretation Activities:

Use the following sire summaries to answer the questions below.

Example 1:

RENEGADE

Bull A

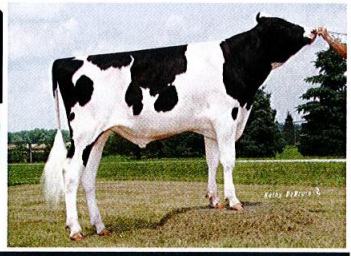
$30

1HO11863 CO-OP RENEGADE-ET

Birth Date: 03/10/13
840 Reg. 3011816312
99% RHA-I

Sire DE-SU BKM MCCUTCHEN 1174-ET
Dam CO-OP M-P ATWOOD ROSETTE-ET, VG-86, VG-MS
2-02 3x 305d 27,570m 4.5 1253f 3.3 918p lbs.

- Offers stylish type without sacrificing profitability and fitness
- Appealing MABL$ tracing back to GENESIS and Sharky Robin



MCCUTCHEN X G W ATWOOD X SHARKY

Daughters G Herds G

CDCB PTA, CRI 8/2016

ICC$	+$637	Net Merit	+$607	78%Rel	91% ile
HLTH$	+$223	Cheese Merit	+$632		
FYFT$	+$34	Milk	+873	80%Rel	
CABL$	+$23	Protein	+40	+0.05%	
PREF$	+$202	Fat	+77	+0.16%	
MABL$	+$155	CFP	+117		
		Prod. Life	+3.7		
		DPR	+0.1	73%Rel	
		SCS	+2.98		

HA-USA PTA 8/2016

Type	+2.75	78%Rel	aAa	423
UDC	+2.22		DMS	123126
FLC	+2.73		Beta-Casein	A1A2
TPI®	+2497		Kappa-Casein	AE

CDCB PTA, CRI 8/2016

Sire Calving Ease	6.7%	99%Rel
Dau. Calving Ease	5.2%	66%Rel
Sire Stillbirth	8.4%	95%Rel
Dau. Stillbirth	6.4%	61%Rel
Sire Fertility (SCR)	+1.9	99%Rel
HCR	2.2	66%Rel
CCR	0.1	72%Rel
SynchCheck™	101	96%Rel
PregCheck™	102	98%Rel

CDN 8/2016

Body Condition Score	98
Mastitis Resistance	101
Milking Speed	107
Milking Temperament	106

HA-Trait Profile

Trait		Profile	STA
Stature	Short	Tall	3.2
Strength	Frail	Strong	1.4
Body Depth	Shallow	Deep	1.7
Dairy Form	Tight Rib	Open Rib	2.3
Rump Angle	High Pins	Sloped	0.9
Thurl Width	Narrow	Wide	1.5
Rear Legs-Side Vw.	Posty	Sickle	0.0
Rear Legs-Rear Vw.	Hock-In	Straight	3.0
Foot Angle	Low	Steep	2.6
Feet & Legs Score	Low	High	3.1
Fore Udder Attach.	Loose	Strong	2.5
Rear Udder Height	Low	High	2.7
Rear Udder Width	Narrow	Wide	2.4
Udder Cleft	Weak	Strong	2.0
Udder Depth	Deep	Shallow	2.5
Front Teat Place.	Wide	Close	1.1
Rear Teat Place.	Wide	Close	1.1
Teat Length	Short	Long	0.9

-2 -1 0 1 2

RAZOR

Bull B

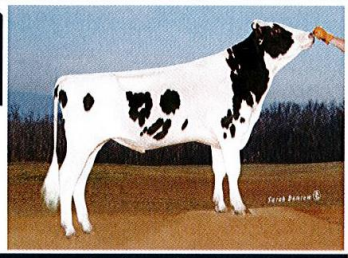
$25

1HO11385 MCNALLAN JAYDEN RAZOR-ET

Birth Date: 12/21/13
840 Reg. 3013523361
96% RHA-NA

Sire KRALL-VIEW RBST JAYDEN-TW
Dam MCNALLAN PROPER 4759, GP-82
2-02 3x 324d 28,110m 3.4 957f 3.0 842p lbs.

- Incredible health traits
- Tightly-attached, youthful udders with the right amount of cleft



JAYDEN X PROPER X FREDDIE

Daughters G Herds G

CDCB PTA, CRI 8/2016

ICC$	+$776	Net Merit	+$605	76%Rel	91% ile
HLTH$	+$357	Cheese Merit	+$616		
FYFT$	+$104	Milk	+517	78%Rel	
CABL$	+$45	Protein	+18	+0.01%	
PREF$	+$161	Fat	+31	+0.04%	
MABL$	+$109	CFP	+49		
		Prod. Life	+8.2		
		DPR	+4.0	70%Rel	
		SCS	+2.74		

HA-USA PTA 8/2016

Type	+0.56	76%Rel	aAa	342
UDC	+1.74		DMS	456561
FLC	+0.75		Beta-Casein	A1A1
TPI®	+2300		Kappa-Casein	BE

CDCB PTA, CRI 8/2016

Sire Calving Ease	6.0%	86%Rel
Dau. Calving Ease	4.8%	65%Rel
Sire Stillbirth	7.2%	73%Rel
Dau. Stillbirth	5.8%	59%Rel
Sire Fertility (SCR)	+1.6	95%Rel
HCR	-0.7	62%Rel
CCR	3.9	68%Rel
SynchCheck™	103	90%Rel
PregCheck™	102	95%Rel

CDN 8/2016

Body Condition Score	107
Mastitis Resistance	104
Milking Speed	101
Milking Temperament	99

HA-Trait Profile

Trait		Profile	STA
Stature	Short	Tall	0.8
Strength	Frail	Strong	1.1
Body Depth	Shallow	Deep	2.1
Dairy Form	Tight Rib	Open Rib	1.4
Rump Angle	High Pins	Sloped	1.0
Thurl Width	Narrow	Wide	0.2
Rear Legs-Side Vw.	Posty	Sickle	0.9
Rear Legs-Rear Vw.	Hock-In	Straight	0.7
Foot Angle	Low	Steep	1.1
Feet & Legs Score	Low	High	0.6
Fore Udder Attach.	Loose	Strong	2.5
Rear Udder Height	Low	High	2.0
Rear Udder Width	Narrow	Wide	1.8
Udder Cleft	Weak	Strong	0.8
Udder Depth	Deep	Shallow	2.1
Front Teat Place.	Wide	Close	0.7
Rear Teat Place.	Wide	Close	0.6
Teat Length	Short	Long	0.2

-2 -1 0 1 2

What does DPR stand for?

Which bull would you select if this was a trait you were interested in?

Example 2:

LENOX

Bull A

1H011051 FAIRMONT KRISTOFF LENOX-ET

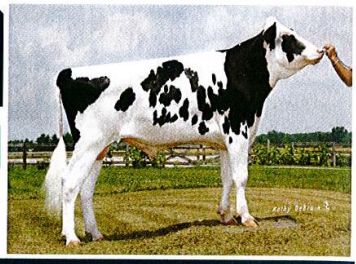
$19

Birth Date: 10/24/12
USA Reg. 71624085
100% RHA-NA

Genes

Sire BRANDT-VIEW KRISTOFF-ET
Dam FAIRMONT SHOTLE LANI-ET, VG-85, VG-MS
2-04 2x 236d 17,441m 3.7 642f 3.1 548p lbs.

- Stylish daughters with excellent fertility
- Elite SCS



KRISTOFF X SHOTTLE X GOLDWYN

Daughters G Herds G

CDCB PTA, CRI 8/2016

ICC$	+$483	Net Merit	+$447	77%Rel	68% ile
HLTH$	+$196	Cheese Merit	+$471		
FYFT$	+$61	Milk	+248	79%Rel	
CABL$	+$29	Protein	+15	+0.03%	
PREF$	+$53	Fat	+41	+0.12%	
MABL$	+$144	CFP	+56		
		Prod. Life	+3.5		
		DPR	+2.0	72%Rel	
		SCS	+2.61		

HA-USA PTA 8/2016

Type	+1.68	78%Rel	aAa	243
UDC	+2.02		DMS	123234
FLC	+0.70		Beta-Casein	A1A2
TPI®	+2249		Kappa-Casein	BE

CDCB PTA, CRI 8/2016

Sire Calving Ease	7.1%	99%Rel
Dau. Calving Ease	4.7%	66%Rel
Sire Stillbirth	8.3%	95%Rel
Dau. Stillbirth	5.4%	61%Rel
Sire Fertility (SCR)	+2.6	98%Rel
HCR	0.2	65%Rel
CCR	2.5	71%Rel
SynchCheck™	103	95%Rel
PregCheck™	102	98%Rel

CDN 8/2016

Body Condition Score	100
Mastitis Resistance	106
Milking Speed	102
Milking Temperament	100

HA-Trait Profile

Trait		Profile		STA
Stature	Short		Tall	1.9
Strength	Frail		Strong	0.8
Body Depth	Shallow		Deep	0.8
Dairy Form	Tight Rib		Open Rib	0.9
Rump Angle	High Pins		Sloped	0.7
Thurl Width	Narrow		Wide	0.5
Rear Legs-Side Vw.	Posty		Sickle	1.1
Rear Legs-Rear Vw.	Hock-In		Straight	0.0
Foot Angle	Low		Steep	1.4
Feet & Legs Score	Low		High	0.9
Fore Udder Attach.	Loose		Strong	2.3
Rear Udder Height	Low		High	2.4
Rear Udder Width	Narrow		Wide	2.2
Udder Cleft	Weak		Strong	1.3
Udder Depth	Deep		Shallow	2.4
Front Teat Place.	Wide		Close	1.4
Rear Teat Place.	Wide		Close	1.0
Teat Length	Short		Long	0.7

-2 -1 0 1 2

LIFELONG

Bull B

1H011025 CO-OP UPD GREATEST LIFELONG

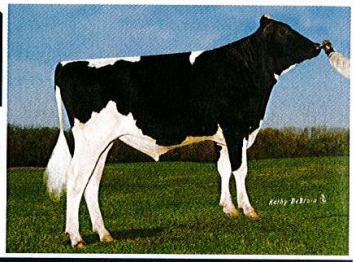
$25

Birth Date: 08/08/12
USA Reg. 71922001
100% RHA-NA

Genes

Sire DEN-K ALTAGREATEST
Dam MS WELCOME MM LULITA CRI-ET, VG-85, VG-MS
2-03 3x 365d 32,800m 4.3 1399f 3.4 1111p lbs.

- Use for sire fertility
- Moderate frame size



ALTAGREATEST X MAN-O-MAN X SHOTTLE

Daughters G Herds G

CDCB PTA, CRI 8/2016

ICC$	+$664	Net Merit	+$525	78%Rel	81% ile
HLTH$	+$165	Cheese Merit	+$526		
FYFT$	+$21	Milk	+1622	80%Rel	
CABL$	+$31	Protein	+47	-0.01%	
PREF$	+$340	Fat	+53	-0.03%	
MABL$	+$107	CFP	+100		
		Prod. Life	+3.8		
		DPR	+0.6	73%Rel	
		SCS	+2.88		

HA-USA PTA 8/2016

Type	+0.81	78%Rel	aAa	315
UDC	+0.20		DMS	234345
FLC	+0.52		Beta-Casein	A2A2
TPI®	+2243		Kappa-Casein	AB

CDCB PTA, CRI 8/2016

Sire Calving Ease	7.1%	99%Rel
Dau. Calving Ease	5.4%	66%Rel
Sire Stillbirth	7.1%	96%Rel
Dau. Stillbirth	5.6%	61%Rel
Sire Fertility (SCR)	+1.9	98%Rel
HCR	0.2	66%Rel
CCR	1.2	71%Rel
SynchCheck™	100	97%Rel
PregCheck™	101	99%Rel

CDN 8/2016

Body Condition Score	103
Mastitis Resistance	104
Milking Speed	105
Milking Temperament	108

HA-Trait Profile

Trait		Profile		STA
Stature	Short		Tall	0.2
Strength	Frail		Strong	0.6
Body Depth	Shallow		Deep	0.3
Dairy Form	Tight Rib		Open Rib	0.4
Rump Angle	High Pins		Sloped	0.4
Thurl Width	Narrow		Wide	0.7
Rear Legs-Side Vw.	Posty		Sickle	0.5
Rear Legs-Rear Vw.	Hock-In		Straight	0.6
Foot Angle	Low		Steep	0.4
Feet & Legs Score	Low		High	0.7
Fore Udder Attach.	Loose		Strong	0.3
Rear Udder Height	Low		High	1.3
Rear Udder Width	Narrow		Wide	1.2
Udder Cleft	Weak		Strong	0.1
Udder Depth	Deep		Shallow	0.0
Front Teat Place.	Wide		Close	0.8
Rear Teat Place.	Wide		Close	1.0
Teat Length	Short		Long	0.7

-2 -1 0 1 2

Complete the following chart:

Bull A	Bull B
Milk =	Milk =
Fat =	Fat =
Protein =	Protein =

If you are looking for a bull that has daughters with good fat and protein production, which bull would you select and why?

U.S. Genetic Evaluations

Ideal Commercial Cow (ICC$) Index
A genetic ranking developed by Genex. ICC$ is designed to breed for farm profitability and efficiency using real-time economic indicators and science based genetic principals to breed ideal commercial cows. The index incorporates elements from the U.S. national evaluation and other sources. ICC$ is the combination of five sub-indexes to provide dairy producers the opportunity to emphasize genetic selection for specific management areas.

- Production Effciencey (PREF$)
- Health (HLTH$)
- Fertility and Fitness (FYFT$)
- Milking Ability (MABL$)
- Calving Ability (CABL$)

Lifetime Net Merit $ (LNM$)
LNM$ measures net profit over the lifetime of a bull's average daughter. Traits and weightings in the LNM$ index: Fat 22%; Protein 20%; Milk -1%; Productive Life 19%; SCS -7%; DPR 7%; Heifer Conception Rate (HCR) 2%; Cow Conception Rate (CCR) 1%; Calving Ability $ 5%; UDC 6%; FLC 3%; BCS -5%

Lifetime Cheese Merit $
Lifetime Cheese Merit $ was designed for producers who sell milk in a cheese market. Protein has more value in the cheese market than it does in the standard component pricing market. Milk receive a negative economic weight in the Cheese Merit index. The Lifetime Cheese merit index combines the same traits as the Lifetime Net Merit index.

Reliability (REL or R)
A measure of the amount of information in a trait. Reliability is expressed as a percentage, ranging from 1 to 99. The closer the Reliability is to 99, the more reliable the proof.

Daughters
The number of daughters included in the bull's milk proof. A "G" identifies evaluations based on pedigree information and genomic testing.

Herds
The number of different herds a bull's daughters are located in (considering daughters which are included in the bull's milk proof). A "G" identifies evaluations based on pedigree information and genomic testing.

PTA Milk
PTA for milk production in pounds, reflecting the expected milk production of future mature daughters.

PTA Fat Pounds
PTA for butterfat in pounds, reflecting the expected butterfat production of future mature daughters.

PTA Fat Percent
Indicates the genetic variance of a bull's PTA for transmitting fat as being positive or negative.

Combined Fat and Protein (CFP)
The sum of PTA Fat pounds and PTA Protein pounds.

PTA Protein Pounds
PTA for protein production in pounds, comparing the expected production of future mature daughters.

PTA Protein Percent
Indicates the genetic variance of a bull's PTA for transmitting protein as being positive or negative.

PTA Productive Life
Productive Life is a measure of longevity, measured in months.

PTA Somatic Cell Score (SCS)
The PTA for SCS is used to improve mastitis resistance. Bulls with low PTA for SCS (less than 3.0) are expected to have daughters with lower mastitis than bulls with high PTA for SCS (greater than 3.5).

Dau. Pregnancy Rate (DPR)
Percentage of nonpregnant cows that become pregnant during each 21-day period. A DPR of '1' implies that daughters from this bull are 1% more likely to become pregnant during that estrus cycle than a bull with an evaluation at zero.

PTA Type (PTAT)
PTA Type is an estimate of the genetic superiority for conformation that a bull will transmit to its offspring. This is directly correlated with the final score of the bull's daughters, not the linear traits.

Udder Composite (UDC)
Udder Composite is an index based on ability for udder improvement. Udder composite includes six linear traits, and the weighting for each trait's contribution to higher udder scores. The traits and their weightings are: udder depth-35%, front teat placement 5%, rear teat placement-7%, fore udder attachment-16%, rear udder height-16%,rear udder width-12% and udder cleft-9%.

Feet and Legs Composite (FLC)
FLC is a measure of a bull's ability for foot and leg improvement. Weights for the four traits in the composite are: feet and leg score-50%, foot angle-24%, rear legs-rear view-18.5% and rear legs-side view-7.5%.

TPI® (Total Performance Index)
TPI is an index calculated by Holstein Association USA. Traits and weightings in TPI: Protein 27%; Fat 16%; Feed Efficiency 3%; PTAT-Final Score 8%; Dairy Form -1%; UDC 11%; FLC 6%; Productive Life 7%; SCS 5%; Fertility Index 13%; Daughter Calving Ease 2%; Daughter Stillbirth 1%

Calving Ease
Sire Calving Ease: Percentage of Estimated Difficult Births in Heifers (EDBH) when they calve for the first time. Using bulls 7% EDBH or less can be used to reduce stress on first-calf heifers.

Daughter Calving Ease: Tendency of daughters of a particular sire to have more (or fewer) problems at calving than an average cow and to produce calves that are born more easily (or difficult) than calves produced by an average cow.

Stillbirth
Service Sire Stillbirth: measures the tendency of calves from a particular service sire to be stillborn more or less often.

Daughter Stillbirth: measures the ability of a particular cow (daughter) to produce live calves. Stillbirth is expressed as percent stillbirths, where stillborn calves are those scored as dead at birth or born alive but died within 48 hours of birth.

Fertility
Sire Fertility: Service Sire Conception Rate (SCR) is the difference of conception rate of sire expressed as a percent comparison. SCR is based on conception rate rather than non-return rate. SCR utilizes multiple services per lactation (up to 7), rather than first service only. A SCR of 1.2 means the bull is 1.2% above average.

PregCheck™: PregCheck is our internal fertility ranking prediction model and data collection process. Fertility is measured using cow records that have a pregnant or open diagnosis. A one point difference in Preg Check equals a 1% expected change in conception rate.

SynchCheck™: SynchCheck evaluates conception of sires when bred to females which have been synchronized (ovulation induced through hormonal treatment).

Linear Type Traits
Genetic evaluations for the 18 linear type traits are expressed as Standard Transmitting Abilities (STAs). Standardized values are used because each trait has a different average PTA, and the PTA ranges vary within traits.

Genetic Base
The genetic base for the evaluations is PTA 15, representing the average of cows born in 2010.

Beta-Casein
Beta-Casein is a major casein protein making up 30% of the total milk protein. Studies have shown health benefits for diseases such as type 1 diabetes, IHD, schizophrenia and autism.

- A2A2 - Most ideal test result
- A1A2 - Median result - produces equal amounts of A1 and A2
- A1A1 - Least ideal test result

Kappa-Casein (cheese production)
There are many forms of Kappa-Casein A, B and E associated with milk protein and quality. Variants are related to the processing of cheese. Studies show yield for cheese production is higher with BB milk versus AA milk.

- BB - Preferred result for cheese production
- AB + BE - Intermediate result for cheese production
- AA + AE - Least favorable result for cheese production

Heifer Conception Rate (HCR)
HCR is the percentage of inseminated virgin heifers that become pregnant. A bull with a +1 evaluation would have daughters that as heifers would be 1% more likely to become pregnant. Services are only included if the heifer is at least 12 months old and less than 2.2 years.

Cow Conception Rate (CCR)
CCR is the lactating cow's ability to conceive based on the percentage of cows inseminated that become pregnant. If a bull's CCR is +1, his daughters would be 1% more likely to become pregnant during that lactation than a bull with an evaluation of 0. CCR simply looks at the daughter's ability to conceive when inseminated.

Body Condition Score (BCS)
BCS is sourced from the Canadian Dairy Network (CDN). BCS reflects the animal's energy balance status in which research has clearly shown an association with improved female fertility, longevity and disease resistance. BSC evaluations are expressed as relative breeding values with 100 being average. The scale of expression generally varies from 85 for bulls with daughters that generally have very low scores for body condition to 115 or higher for bulls with daughters that have high scores. Bulls rated over 100 are more desired.

Mastitis Resistance (MR)
MR is sourced from the CDN. MR combines both clinical and sub-clinical mastitis into a single genetic selection index. The MR index puts equal weighting on the three areas of clinical mastitis in first lactation cows, clinical mastitis in later lactations and somatic cell score across the first three lactations. MR is expressed as a relative breeding value where 100 is average.

Milking Speed and MilkingTemperament
Data points come from the CDN. Milking Speed is evaluated in terms of the percentage of first lactation daughters evaluated as average or fast. Milking Temperament can be defined as milking behavior. Milking Temperament is expressed in terms of the expected percentage of future daughters evaluated as average, calm or very calm during their first lactation. A bull with a score of 100 for both traits indicates average.

University of Wisconsin-Extension

Steps in the selection process:

1. Determine the goals of the farm
   a. Increased milk yield
   b. Increased protein and fat yield
2. Select the animals you want to become parents
   a. Select females you want to keep in the herd and breed
   b. Review bull proofs and determine which bulls fit with your herd goals
3. Determine which sire should be bred to which dam
4. Make the correct mating

For more information contact
Heather Schlesser
Agriculture Educator
UW- Extension, Marathon County
212 River Dr. Suite # 3
Wausau, WI 54403
715-261-1230
Heather.schlesser@ces.uwex.edu
http://marathon.uwex.edu/

Getting the Dairy Herd You Want Through Improved Genetic Selection

Information compiled by Heather Schlesser, PhD,
Agriculture Educator
UW-Extension

"Breeding is an art to be learned only by practice, but knowledge of principles supplies the only firm foundation for its practice. Superior animals will be more numerous when breeders know why as well as how." – Professor V.A. Rice, 1926

Picking animals for your farm is one of the most important decisions you can make to improve long-term profitability. Whether it is choosing replacements, or deciding who will become parents, without proper consideration the decisions could end up giving you the genetics you did not want. The purpose of this article is to help you understand the principles to position your breeding program for success.

There are many different variables to consider when deciding who should become parents, how many offspring an animal should have, or the length of time an animal should stay in the herd. These characteristics range from production traits, such as milk yield, fat and protein percent; to type traits, such as feet and leg conformation. Only you can determine what traits are important for your herd.

Often times a producer will have a goal in mind, and try to pick animals that will help them meet this goal. If a producer wants to increase milk production, they will select bulls with high milk yield Predicted Transmitting Ability (PTA). However, if the farmer has a cow with good milk production and poor feet and legs, they will try to find a bull that has good milk yield PTAs, but also has good feet and legs. This way the offspring will hopefully, still have good milk production, but also better feet and legs than the dam.

How do you determine which animals to keep and ultimately breed?

1. Look at the information available on the individual
2. Look at information available on relatives

Individual information tells you what traits the animal exhibits. This is only useful for some traits. For example, bulls do not produce milk, so we need to look at data on relatives to determine a value for the bulls.

Pedigree information tells us about the genetic stock from which the animal is produced. Data on siblings is more valuable, because this tells us what has been potentially passed down to the individual. This is known as heritability. The best information is gained when the animal has offspring, because this tells us what the animal is capable of passing on to future generations.

Genomics is a new tool on the market that allows producers to determine the genetic potential of an animal well before the animal reproduces and has production records of its own. Genomics has the potential to evaluate 50,000 genetic markers at one time. When a genomics estimate is created, pedigree information, estimates of merit from genetic markers, the animals own performance records (if available), and progeny's performance records (if available) are taken into consideration.

Once you have determined which animals to use in your herd one needs to determine which animals to breed together.

There are six different mating systems that can be used: Random Mating, Positive Assortative Mating; Negative Assortative Mating, Inbreeding, Outbreeding, and Crossbreeding.

Random Mating: Equal chance of mating with any other individual in the population. With this system one does not care which bull breeds which dam, one just wants them bred. (The farmer chooses the sires and dams).

Positive Assortative Mating: Mating best to best, and worst to worst. One would use this system to increase milk production, breeding the best to the best.

Negative Assortative Mating: Mating between extremes. This type of mating results in an animal in-between the two parents. One would use this if one has a dam that is very short/tall and you want her more of a medium height. One could also use this to correct leg angle.

Inbreeding: Mating related animals together. This can help capitalize on traits that you find favorable, however, there are also consequences. As an animal becomes more inbred milk production decreases and calf mortality increases.

Outbreeding: Mating of unrelated animals. With the use of artificial insemination (AI), this is becoming more difficult, as populations around the world are becoming more related to one another.

The first tool of the animal breeder was the fence. – R.D. Shanks

Crossbreeding: Mating animals of different breeds. The offspring normally benefit from hybrid vigor, meaning that the offspring normally has gains related to both breeds. The first generation crossbred is the best one can get; future generations will not perform as well as the first generation.

Not all bulls are created equal. Table 1 below is an example of one AI company's bull proofs. Bulls in the $20-$30 range have been selected for comparison. Choosing a bull based on the cost of his semen does not take into consideration your selection criteria. The bull one chooses should depend on one's selection criteria instead of the cost of his semen. For example, James is the most expensive bull selected below. If selecting on Life Time Net Merit (LNM$), James (776) would not be the bull to choose, because Erdman (808) has a higher Life Time Net Merit and costs $3 per unit of semen less. However, if selecting for Milk Production (Milk), James (1795) would be the bull to select. If choosing bulls based on Daughter Pregnancy Rate (DPR) then the most economical bull on the page, Awesome (2.30), would be the best selection. Knowing which bull to select takes time and careful analysis. Giving your AI technician a dollar range to choose from does not guarantee you are getting bulls that fit your herd. One may actually be getting bulls that are harder on the pocket book and further from your goals than you expected.

Table 1: Bull proof with bulls pricing between $20-$30 selected for comparison. Use of this table does not indicate endorsement of the company or bulls.

Code	Name	Profit Shop	LNM$	Rel	LCM	Prot	P%	Milk	Fat	F%	Rel	SCE	Rel	Type	UDC	F&LC	TPI™	PL	SCS	DPR	SCR
1HO10396	CABRIOLET *TV %-I	$50	908	68	979	62	0.05	1620	97	0.15	73	6	57	1.64	1.26	1.23	2367	7.00	2.81	0.90	-1.6
1HO10837	FLYN #,%-I	X	895	68	953	60	0.04	1686	83	0.08	72	5	58	1.95	1.76	1.42	2391	7.30	2.73	1.00	NA
1HO10559	RAINIER *TV	$40	869	70	923	55	0.03	1582	107	0.19	75	7	57	1.46	1.48	0.65	2325	5.70	2.71	1.30	+0.3
1HO10788	JACEY *TV #,%-I	X	825	70	911	66	0.04	1799	64	-0.01	74	7	57	2.72	2.27	2.23	2466	4.90	2.44	1.80	NA
1HO10648	PUZZLE *TV %-I	$40	819	70	840	54	0.01	1737	60	-0.01	75	7	65	2.33	2.39	1.40	2359	7.60	2.84	1.90	+2.6
1HO10814	KEYBOARD #	X	813	70	848	61	0.01	1931	59	-0.04	75	7	56	2.39	2.28	1.20	2341	7.10	2.67	0.80	NA
1HO09800	ERDMAN *TV %-I	$25	808	73	848	38	0.02	1098	68	0.11	76	5	98	1.45	1.65	0.35	2210	7.70	2.70	1.90	-1.1
1HO10644	INDY *TV %-I	$32	801	70	864	53	0.03	1518	64	0.03	75	6	57	2.37	2.18	1.04	2346	6.10	2.53	1.60	+1.3
1HO10668	EVAN #,%-I	X	801	67	853	47	0.03	1292	71	0.09	72	7	57	1.42	0.92	0.56	2223	6.70	2.72	2.70	-0.9
1HO10490	GALAXY *TV %-I	X	797	71	832	63	0.00	2037	81	0.02	75	7	82	2.93	2.32	1.90	2418	5.10	2.65	0.50	+2.2
1HO10696	YOVANI #	X	789	68	902	53	0.08	1029	73	0.13	73	6	57	1.57	1.96	1.13	2244	5.90	2.67	0.30	NA
1HO10856	JAYDEN #	X	785	69	870	33	0.07	536	69	0.19	74	7	57	1.13	1.95	2.06	2230	6.60	2.72	2.20	NA
1HO08784	FREDDIE *TV %-I M	$60	779	95	822	43	0.02	1236	54	0.03	99	5	99	1.57	1.60	2.87	2292	6.40	2.70	2.80	-0.6
1HO10218	DENIM *TV %-I	$40	778	73	853	44	0.05	1053	63	0.09	77	7	98	0.96	1.14	1.20	2245	6.40	2.60	3.30	+1.8
1HO10733	JAGER #,%-I	X	776	70	866	36	0.06	632	83	0.22	74	5	58	1.87	1.56	1.85	2238	5.50	2.65	1.50	NA
1HO10817	JAMES *CV *CV %-I	$28	776	70	828	59	0.01	1795	81	0.06	74	6	58	1.79	1.52	1.40	2315	4.10	2.53	1.30	NA
1HO10824	TANGO #	X	769	71	771	58	-0.01	2109	72	-0.01	75	7	57	3.16	3.30	2.07	2434	4.70	2.70	0.90	NA
1HO10662	FEEDBACK *TV %-I	$35	767	68	836	34	0.04	703	75	0.19	72	6	58	1.00	1.26	0.38	2133	6.60	2.71	1.90	+3.0
1HO10085	YANO *TV	$40	764	74	805	50	0.02	1487	49	-0.02	77	5	99	1.68	1.48	0.92	2208	7.20	2.70	1.20	+0.8
1HO08777	AWESOME *TV	$20	754	93	866	27	0.08	202	80	0.28	99	5	99	0.32	-0.17	1.21	2063	6.90	2.55	2.30	+1.0
1HO10655	POETRY *TV	$32	740	70	751	58	-0.01	2031	73	0.00	74	7	57	2.63	2.72	0.58	2268	5.90	2.72	-0.7	+1.8
1HO10369	LOYAL *TV	$25	733	70	798	57	0.04	1548	61	0.01	75	7	56	2.47	3.23	0.95	2308	5.30	2.65	0.20	-2.2

Table adopted from: http://genex.crinet.com/dairy/index.php?action=BYBREED&Breed=HO&country_code=UJV&lang=EN

Should I use Young Sires in my herd?

Before a bull has offspring of his own, an estimate of his abilities has traditionally been established based on the average of his Parents' PTAs. Although parent averages give a good estimate to a young sire's true performance, it is well known that some young sires will outperform these estimates or even underperform them. Therefore, by selecting a variety of young sires, you minimize the possibility of getting daughters from only those bulls with PTA values below the parent average.

Young sires are currently being selected by AI companies based on genomic estimates. Genomic estimates take into consideration the animals pedigree (Parent PTA values), offspring's production data (if available), and estimates of merit at various locations throughout the DNA. Research has shown that genomic estimates are more accurate than using parent averages alone. Genomic estimates make using young sires less risky than in the past.

Semen from young sires is often priced below that of proven bulls. Discounted pricing is done to entice farmers to buy the semen. Increasing sales of young sire semen allows semen companies to calculate conception rate, and calving ease on these bulls more rapidly.

Advances in the ability to estimate PTA values allow producers to use young sires with more confidence. Nearly all of the young sires that underperform their estimated PTA, will outperform a natural service bull. Therefore, gains in genetic selection are still being recognized when using young sires.

Helpful hints:

- If one wants to increase female fertility, one can achieve this through indirect selection for longevity or body condition score, or by direct selection of daughter pregnancy rate (Weigel, 2006).
- If one wants to increase fat and protein percentages, select animals with higher milk yield. While it is true that one gets paid based on percentages of fat and protein, the milk price is absolutely meaningless until you multiply by the number of hundredweights sold.
- When using young sires, use a few units of semen from many different bulls rather than many units of semen from any one bull.
- Clearly decide what type of dairy cow one wants to develop or work with.
- Purchase animals which are already close to the kind of animal eventually desired.
- Recognize the basic concepts of genetics in order to be realistic about desired outcomes.
- Use all the genetic tools which identify sires most likely to produce desired offspring. Furthermore, use selected sires, evaluate their offspring, and **make adjustments where needed**.

University of Wisconsin-Extension

Understanding Sire Summaries

Information Compiled by Heather Schlesser, Marathon County UW-Extension
Reviewed by Sandy Stuttgen UW-Extension Taylor County, and Bill Halfman UW-Extension Monroe County,

Published February 2017

Selecting a herd bull is one of the most important decisions a producer has to make. The decision of selecting what bull to mate to each cow or heifer has long lasting genetics effects in the herd. Sire summaries have been developed to aid a producer in this decision. Sire summaries are updated on a regular basis and provide information on traits that are economically important to cattle producers. The producer needs to decide which traits are important to their farming operation.

Expected Progeny Differences (EPDs) are numbers that predict the genetic quality of future offspring or progeny of a particular bull, cow or heifer. The EPD is the degree of difference between the progeny of the bull and the progeny of the average bull of the breed in the trait being measured. The EPD is given as a plus or minus value. For example, an EPD for yearling weight of +65 would show that the progeny of this bull should average 65 pounds more at 365-days of age then progeny of the average bull of the breed.

EPDs are a prediction based on averages for that breed; keep in mind, bulls with high EPDs for selected traits will produce some calves that are not better than the average for the breed. On the other hand, bulls with low EPDs for selected traits will sire some calves better than the breed average. However, the overall performance of the progeny of low EPD bulls will be lower than the breed average.

It used to be that you could not compare EPDs across breeds. This was partly due to the differences in selection emphasis between breeds. However, in recent years the US Meat Animal Research Center (USMARC) has started calculating across breed adjustment factors. They are currently calculating these adjustment factors for 18 breeds for growth and carcass traits including: birth weight, weaning weight, yearling weight, maternal milk, marbling score, ribeye area, and fat thickness. These factors can be used to adjust the EPD to a common Angus base. USMARC updates these adjustment values on an annual basis to account for genetic change that has occurred. A current list of adjustment factors can be found at: https://www.angus.org/Nce/AcrossBreedEpdAdjFactors.aspx.

If you wat to compare a Hereford bull's EPD for birth weight to an Angus bull's EPD for birth weight you would need to use 2.3 as the adjustment factor. If the Herford bull had an birthweight EPD of 5.3 then on an Angus base the birth weight would be 7.6. Oklahoma State University has created an online calculator to make this across breed comparison easier: http://itle.okstate.edu/sites/beefcalc/.

Things to remember about EPDs

1. Do not compare EPDs from old sire summaries with new sire summaries. Due to the addition of new progeny data, EPDs change with each sire summary.
2. Remember EPDs are an average, not a guarantee. Progeny can individually perform better or worse than the average, but all progeny together perform at the average.
3. Keep in mind that not all breeds use the same abbreviations, so you may find some that are not listed below or you may not find some that are listed.
4. Don't just select your bull based on one trait. Selecting on one trait can leave your herd inferior in other traits. For example, if you only select for high yearling weight, you could end up with low calving ease scores, since larger yearling weight is positively correlated with higher birthing weight.

The traits listed in sire summaries vary slightly among breeds; however, they all evaluate the ability of a sire to transmit growth rate to his progeny in the areas of birth, weaning and yearling weights. Most breeds also evaluate the performance of daughters of the sire. This includes an evaluation of daughter calving ease and/or the ability of daughters to wean heavy calves. In sire summaries the average EPD of the breed is converted to zero, so the EPD value reported reflects the number of points above or below the breed average. Some sire summaries will tell you the breed average but not all provide this information.

Trait abbreviations and meanings that are commonly reported on most EPD tables are as follows:

- **CED: Direct calving ease** – A higher number is better. This number predicts the percentage of unassisted calvings from heifers mated to the bull compared to the heifers mated to the average bull of the breed.
- **BW: Birth Weight** – Negative numbers are okay. This number predicts performance of the sire's calves for actual birth weight compared to the calves sired from the average bull of the breed.
- **WW: Weaning Weight** - Larger positive values are good. This value predicts performance of the sire's calves for actual weaning weight compared to the calves sired from the average bull of the breed.
- **YW: Yearling Weight** - Larger positive values are good. This value predicts performance of the sire's calves for actual yearling weight compared to the calves sired from the average bull of the breed.
- **MCE: Maternal Calving Ease** – You want a positive number. This value predicts percentage of unassisted calvings of this bull's heifer daughters compared to the heifer daughters of the average bull of the breed.
- **MILK (MM): Maternal Milk**– You want this value to be positive. This value predicts weaning weight of the bull's grand-calves due to milk production of the bull's daughters compared to daughters of the average bull of the breed.
- **MWW** – Predicted weaning weight of the bull's grand-calves due to milk production of the bull's daughters plus genes for weaning weight of the calves compared to the average bull of the breed. This is also known in some breed books as total maternal (TM). It is calculated as a combination of the WW score and the MILK score.
- **DOC: Docility** – Positive numbers are good if you want tame animals. This value is a prediction of the animal's temperament, nervousness and flightiness when handled compared to calves of the average bull of the breed.
- **STAY: Stayability** – You want this number to be positive. This value predicts the probability that this sire's daughters will stay in the herd until six years of age compared to the average bull of the breed.
- **CW: Carcass weight** – You want this number to be positive. This value predicts performance of the bull's calves for carcass weight compared to the calves of the average bull of the breed.
- **YG: Yield grade** – You want this number to be positive. This value predicts performance of the bull's calves for yield grade compared to the calves of the average bull of the breed.
- **MARB: Marbling** – You want this number to be positive. This value predicts performance of the bull's calves for marbling compared to the calves of the average bull of the breed.
- **BF: Backfat** – You want this number to be positive. This value predicts performance of the bull's calves for back fat compared to the calves of the average bull of the breed.
- **REA: Ribeye area** – You want this number to be positive. This value predicts performance of the bull's calves for Ribeye area compared to the calves of the average bull of the breed.

- **SHR: Shear score** – This value predicts performance of the bull's calves for shear score compared to the calves of the average bull of the breed. Shear force is the pounds of force required to shear a steak.
- **ACC: Accuracy –** This is the accuracy of the given EPD. Accuracy is the measure of how much the EPD value might change as additional progeny data become available. Sires with more calves in several different herds will have higher accuracy figures. The higher the accuracy value, the less risk there is to an EPD value changing as additional data are included. Accuracy range is from 0.0 to 1.0 or on a percentage basis.

Reference:

Massey, John. Understanding and Using Sire Summaries: BIF Fact Sheet. October 1993. Available: http://extension.missouri.edu/p/G2032 [29 November 2016].

Spangler, Matt and Kuehn, Larry. Can I compare EPDs Across Breeds?. February 1 2017. Available: http://newsroom.unl.edu/announce/beef/6178/35135 [15 February 2017].

Spangler, Matthew. EPD Basics and Definitions. February 9th 2017. Available: http://articles.extension.org/pages/73314/epd-basics-and-definitions [15 February 2017].

CARING FOR THE
FACES & SPACES
OF WISCONSIN

Do We Still Need the AM-PM Rule?

By Ryan Sterry

For over a half century dairy producers have been indoctrinated in the use of the AM-PM rule for AI of dairy cattle. Basically, the AM-PM rule dictates that a cow should receive AI 12 hours after being observed in estrus. If a cow is seen in estrus in the AM she should receive AI that PM, and conversely cows seen in estrus in the PM should receive AI the following morning.

So how did the AM-PM rule come about? Research in the 1940's by George Trimberger at Nebraska demonstrated that conception rates were greatest when cows were inseminated between the middle and the end of estrus, but were still acceptable between 6 to 12 hours after estrus. Cows bred immediately at the beginning of estrus had slightly lower conception rates, thus the recommendation to wait came about. At that point in history, AI in cattle was still in it's infancy, and these findings gave producers the first recommendation on when to AI cattle.

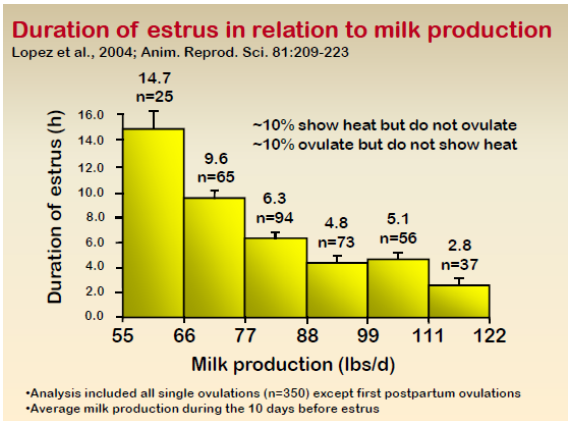
Strictly adhering to the AM-PM rule requires twice daily AI. In recent years, though, studies have indicated that once daily AI can result in the same fertility as twice daily AI.
Nebel et al., 1994. J. Dairy Sci. 77:3185-3191

Treatment	# of Cows	75 d Non-return Rate %
AM/PM rule	3659	60.1
Once Daily AI	3581	60.6

Why the discrepancy? There are a couple possible reasons. First, the experiments by Trimberger did not include the number of cows that is expected by today's standards to draw conclusions. Observations using the HeatWatch System at Virginia Tech do verify much of the early findings though. In their experiment, conception rates were greatest from 4 to 12 hours after the onset of estrus. Cows bred from 0 to 4 hours after the onset of estrus did have lower conception rates.
Dransfield et al., 1998. J. Dairy Sci. 81:1874-82.

Hours onset estrus to AI	Number of Breedings	Conception Rate %
0-4	327	43.1
4-8	735	50.9
8-12	677	51.1
12-16	459	46.2
16-20	317	28.1
20-24	139	31.7
24-26	7	14.3

Secondly, our modern high producing dairy cow exhibits estrous behavior for a shorter time than her ancestors. Work at UW-Madison shows that duration of estrus declines with increasing milk production.



So what is the take home message? Today's high producing dairy cow is more difficult to observe in estrus. If we knew exactly when she first exhibited estrus, there would be some benefit to the AM-PM rule and twice daily AI. But the reality on most farms is that we don't know when a cow first exhibited estrus. There is more risk in breeding a cow too late than too early with the AM-PM rule, which is why once daily AI have proven to be equally successful.

For more information, please contact:

Ryan Sterry
UW-Extension Polk County
Agriculture Agent
(715) 485-8600
ryan.sterry@ces.uwex.edu

Determining Bovine Pregnancy Status

Sandy Stuttgen, DVM, Agriculture Educator, UW-Extension

University of Wisconsin-Extension

For more information contact:
Sandy Stuttgen, DVM
Agriculture Educator
UW-Extension Taylor County
925 Donald St
Medford, WI 54451
Phone 715.748.3327 Ext 1
sandy.stuttgen@ces.uwex.edu
http://taylor.uwex.edu

Contributing author
Ryan Sterry
Agriculture Agent
UW-Extension St. Croix County
ryan.sterry@ces.uwex.edu
http://stcroix.uwex.edu

References:

Fricke, P.M., A. Ricci, P. Carvalho, and M Amundson. 2015. Milk vs blood-which is best for PAG pregnancy prediction? Western Dairy Management Conference, Proceedings, Mar3-5, 2015, Reno, NV

Ricci, A., P.D. Carvalho, M.C. Amundson, R.H. Fourdraine, L . Vincenti and P.M. Fricke. 2014. Factors associated with pregnancy -associated glycoprotein (PAG) levels in plasma and milk of Holstein cows during early pregnancy and their effect on the accuracy of pregnancy diagnosis. J. Dairy Sci. 98:2502-2514.

Rhodes, R.C. The use of milk progesterone assays for reproductive management. Retrieved March 3, 2015 from http://www.wvu.edu/~agexten/forglvst/Dairy/dirm9.pdf

Silva, E., R.A. Sterry, D. Kolb, N. Mathialagan, M.F. McGrath, J.M. Ballman and P.M. Fricke. 2007. Accuracy of pregnancy-associated glycoprotein ELISA to determine pregnancy status of lactating dairy cows twenty-seven days after timed artificial insemination. J. Dairy Sci. 90:4612-4622.

Maintaining a successful reproductive program on today's dairies is an arduous task. While it is rewarding to hear a pronouncement of pregnancy, there is not much the manager can do with that diagnosis. Except wait. Wait to recheck later to make sure the calf is growing. Wait for a calf to be born. So while it is tempting to focus on a positive pregnancy diagnosis, it is important to remember that an early non-pregnancy diagnosis is valuable information to act upon.

The sooner non-pregnant cows can be identified, the sooner they can be re-inseminated. Coupling a non-pregnancy diagnosis with a management decision to quickly reinitiate AI service improves reproductive efficiency and pregnancy rate. Repeat breeders who fail to become or stay pregnant also offer management the option to make a culling decision.

There are direct and indirect methods used to determine pregnancy status. Direct methods involve the direct detection of the tissues and/or associated fluids of the conceptus either manually by transrectal palpation or visualized by transrectal ultrasound. Indirect methods measure reproductive hormones at specific stages after AI or the detection of conceptus specific substances in maternal body fluids.

Direct Determinations

The watch and wait method is the gold standard of measuring pregnancy status. This direct method involves the direct visualization of the calf being born. This method is both sensitive and specific. She either was pregnant and delivered a calf, or she was not; and a calf is not born.

Bumping the calf through the cow's abdominal wall is another direct method of determining pregnancy status. Depending on the size and stature of the cow and the experience of the clinician, the calf may be felt during the last trimester of pregnancy. This is accomplished by vigorously bumping against the cow's right flank with a closed fist, to feel the skeletal mass of the calf. Calf bumping is not the best method of non-pregnancy diagnosis; the calf may be small, or positioned dorsally in the caudal abdomen. Repeated calf bumping on different days at different times may help to improve accuracy of the diagnosis using this method.

Perhaps the oldest form of directly determining pregnancy status involves watching for return to estrus. The bovine estrous cycle is approximately 21 days long, with a range of 17- 24 days. Absence of estrous activity every three weeks until parturition provides strong evidence that conception occurred and the cow did not suffer pregnancy loss. Gestation length in Holsteins is approximately 282 days (9 months).

The need to do better

Successful reproductive managers quickly realize the need for an accurate early determination of pregnancy status so that action can be taken on non-pregnant cows. Managers also need to have confidence in the test result.

While the "watch and wait" method is highly accurate, it is the least time sensitive. Considering the average gestation is around 282 days, that's potentially 9 months a cow could be not pregnant and management doesn't know and can't act upon it. Likewise, estrous detection is an important skill but can be fraught with inaccuracies. Failure alone to observe estrus is not enough to confirm pregnancy. There's always the possibility a cow was in estrus, and management failed to observe it.

Dairy workers should know the signs of estrous behavior. These include: vaginal mucous discharge, increased restlessness and increased vocalization, smelling of other cows, following other cows and attempting to mount them, allowing themselves to be mounted, and a ruffled tail head or mud on their hind flanks from being mounted. Reproductive management plans must include what to do with cows exhibiting estrus.

How well does the test outcome predict true status of the pregnancy?

Positive predictive value: the test correctly identified those truly pregnant; determination of pregnancy was confirmed with recheck by another method and/or at a later date.

Negative predictive value: the test correctly identified those truly not pregnant; determination of non-pregnancy was confirmed with recheck by another method and/or at a later date.

Palpating or visualizing the developing fetus and placenta is a direct method of determining pregnancy status. Skilled veterinarians performing transrectal palpation are able to diagnose pregnancy status beginning approximately 35 days post breeding. Accuracy is achieved with experience. Physical attributes of the cow also have an effect. For example, cows with excessive pelvic fat are harder to palpate.

During transrectal palpation, the veterinarian renders a positive diagnosis of pregnancy when he/she palpates a fluid filled uterine horn, the presence of a mature corpus luteum (CL) ipsilateral to the fluid filled horn, presence of amniotic vesicle (approximately 35 days post conception,) and/or placenta, (approximately 40 days post conception). Palpation also allows evaluation of uterine and ovarian pathology.

When using transrectal ultrasonography, visualization of a corpus luteum on the ovary ipsilateral to the fluid-filled uterine horn containing an embryo with a heartbeat is the basis for a positive pregnancy diagnosis. This can be confidently visualized 30 days post breeding. Ultrasound allows the visualization of dead embryos, ovarian pathology, uterine morphology and twins. Fetal sex can be accurately diagnosed at fetal age 55 to 60 days.

Researchers have concluded the overall accuracy of transrectal ultrasonography for determination of pregnancy status 27 days after timed AI to be 95% when the previously determined cows were rechecked at a later date. The positive predictive value was 90%. The negative predictive value was correct for 98% The positive predictive value is lower because of the normal early pregnancy loss; these cows may have been pregnant at the early ultrasound determination, only to be found open at re-check. Twins decrease the positive predictive value of the diagnosis. Pregnancy loss is three-fold higher for cows carrying twins versus singletons (Silva et al.).

Indirect Determinations

Measuring the reproductive hormone progesterone is an example of an indirect method. Progesterone (P4) monitoring is used to identify non-pregnant cows. Cow-side kits which measure P4 in milk are currently available. P4 monitoring has a 95% to 100% negative predictive value, low progesterone levels on day 21, or better yet on day 23 after last estrous (post-AI) indicate the cow is open. Mastitis can disguise progesterone; milk from mastitic quarters yields low P4. The positive predictive value of milk P4 is 80%. This low positive predictive value is due to embryonic mortality. P4 will remain high with pyometra. (Rhodes).

The hormone progesterone is secreted by the corpus luteum (CL) and is responsible for maintaining the pregnancy. If cow is pregnant, or a fluid filled uterine horn signals pregnancy, progesterone persists beyond the next heat cycle. At best, you can use milk progesterone tests to tell you if cow is open 21-24 days after last breeding. Monitoring milk progesterone may help you perform better heat detection. Serial monitoring would give you a good indication of her reproductive cycle.

Bovine pregnancy-associated glycoprotein (PAG) is secreted by binucleate cells present in cotyledons. Over 20 different bovine PAGs have been identified. While researchers do not understand the function of these PAGs, better testing techniques now allow them to be used as a chemical marker for pregnancy diagnosis.

An ELISA blood test was developed to detect six PAGs as a method for early pregnancy diagnosis. Consistent measurable PAG levels in maternal blood plasma occurs 15 days after conception and peaks at day 32 post conception. PAG levels then sharply decline to a nadir from day 53 to 60 days post conception, gradually increasing to 74 to 102 days. Increasing levels are measured as the cotyledon mass grows while supporting the growing fetus, and remain high until 60 days after calving. (Ricci et al, 2015).

Primiparous cows have greater PAG levels than multiparous cows. Researchers do not know why the six PAGs measured by ELISA drop to a low level 53 days after conception and then why they rebound. It is unknown what is happening with the other PAGs not measured by the available test.

Commercial blood plasma ELISA PAG tests currently being offered by various private veterinary clinic and commercial animal health laboratories include BioPRYN, DG29 and the IDEXX Bovine Pregnancy Test. When mailed overnight, it takes approximately 36 hours from sample collection to receive outcomes from the lab. Scheduling with mail services must be taken into account when submitting samples.

Overall accuracy of determining pregnancy status when measuring plasma PAG at 32 days post AI was found to be 95%. The positive predictive value using plasma PAG was 91%, the negative predictive value was 97%. Prediction of non-pregnancy is highly accurate, just as it is for transrectal ultrasonography. Early pregnancy loss contributes to the lower accuracy of an early pregnancy diagnoses (Silva et al).

PAGs secreted in maternal blood are transferred to milk; however, milk PAG levels are approximately two-fold less than plasma PAG levels. IDEXX Laboratories has developed a commercial milk ELISA to measure PAG. Milk PAG levels peak 32 to 39 days post-conception. Milk PAG levels then slowly decline to a nadir from 46 to 67, rebounding to higher levels 74 to 102 days post conception. Milk PAG drops sooner and remains lower longer than does plasma PAG. PAGs are measurable in milk for 60 days after calving.

Plasma and milk PAG levels are negatively correlated with milk production for both primiparous and multiparous cows (Ricci et al, 2015). Dilution of milk PAG by increased milk production is not the reason for why milk PAG declines, because plasma PAG also declines as milk production increases. While scientists speculate the reasons for this negative correlation, those evaluating test outcomes must bear in mind the cows' milk production may cause a false negative test result. Rechecks may be needed.

Accuracy of both plasma and milk PAG testing compared to transrectal ultrasonography was evaluated from 25 to 102 days after AI. Overall accuracy for correctly identifying 32 day pregnancy status to recheck status was 92% for plasma and 89% for milk PAG levels. The plasma PAG positive predictive value was 84% while its negative predictive value was 100%. The milk PAG positive predictive value was 78% and its negative predictive value was 99% (Ricci et al).

The importance of Re-checks

It has long been recommended that pregnancy status should be determined in dairy cows as soon as possible after AI, but without having the diagnosis confounded by subsequent pregnancy loss. Various research trials confirm a normal 13% pregnancy loss occurring from 27 to 31 days and 38 to 50 days in gestation (Ricci, et al, 2014). An early diagnosis of pregnancy (less than 50 days after AI) must be re-confirmed at a later date to identify cows that experience early embryonic death.

In Summary

Managers have several direct and indirect methods available for determining bovine pregnancy status. It is important for managers to have confidence in the determination of a non-pregnant outcome so they can act on that information. Accuracy is correlated to the days post service the determination is made. Coupling a non-pregnancy diagnosis with a management decision to quickly re-inseminate the cow improves reproductive efficiency and pregnancy rate.

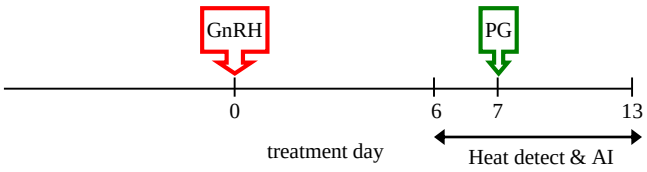
* Days post AI	Pregnant	Recheck	Non-Pregnant
Visual return to estrus	Does not return to heat until after calves	Does not return to heat every 21 days	Returns to heat every 21 days
Progesterone assay		High P4 on day 23	Low P4 on day 23
Transrectal palpation	Fetus day 50 -60	CL, membrane slip/amniotic vesicle day 35-40	No conceptus day 35-40, no CL, developing follicle
Transrectal ultrasound	Fetal sex day 58	Amniotic vesicle/fetal heartbeat day 30	No conceptus day 30, no CL, developing follicle
Blood PAG	Positive day 74	Positive day 32 False negative w/ high milk production	Negative day 32
Milk PAG	Positive day 74	Positive day 32-39 False negative w/ high milk production	Negative day 32-39
Blood or Milk PAG		False positive: < 60 days since last pregnancy False negative: blood: 53-60 days milk: 46-67 days	

* Days post AI	Pregnant	Recheck	Non-Pregnant
Visual return to estrous	Does not return to heat until after calves	Does not return to heat every 21 days	Returns to heat every 21 days
Progesterone assay		High P4 on day 23	Low P4 on day 23
Rectal palpation	Fetus day 50 -60	CL, membrane slip/amniotic vesicle day 35-40	No conceptus day 35-40, no CL, developing follicle
Ultrasound	Fetal sex day 58	Amniotic vesicle/fetal heartbeat day 30	No conceptus day 30, no CL, developing follicle
Blood PAG	Positive day 74	Positive day 32 False negative w/ high milk production	Negative day 32
Milk PAG	Positive day 74	Positive day 33-39 False negative w/ high milk production	Negative day 33-39
Blood or Milk PAG		False positive: < 60 days since last pregnancy False negative: blood: 53-60 days milk: 46-67 days	

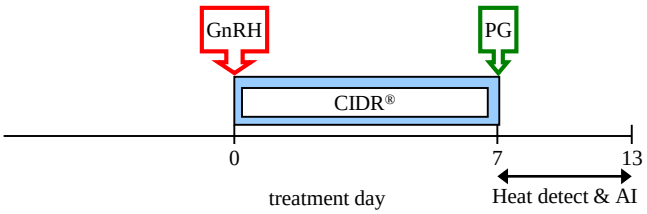
BEEF COW PROTOCOLS - 2019

HEAT DETECTION

Select Synch

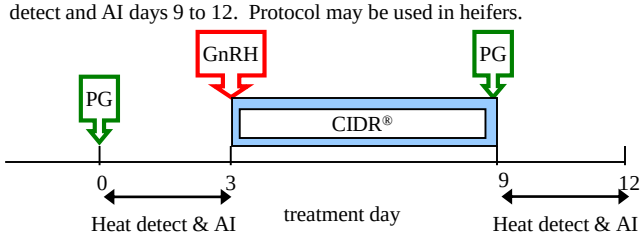


Select Synch + CIDR®



PG 6-day CIDR®

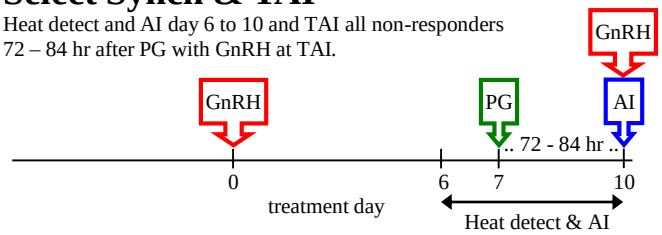
Heat detect and AI days 0 to 3. Administer CIDR to non-responders and heat detect and AI days 9 to 12. Protocol may be used in heifers.



HEAT DETECT & TIME AI (TAI)

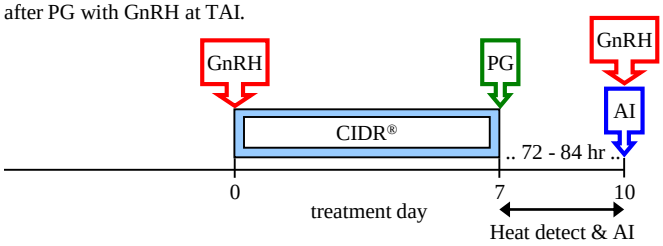
Select Synch & TAI

Heat detect and AI day 6 to 10 and TAI all non-responders 72 – 84 hr after PG with GnRH at TAI.



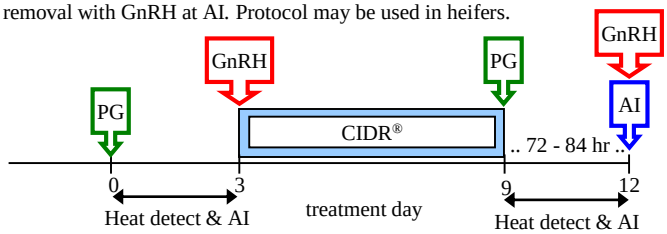
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders 72 - 84 hr after PG with GnRH at TAI.



PG 6-day CIDR® & TAI

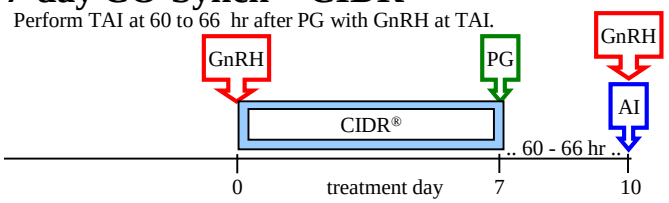
Heat detect & AI days 0 to 3. Administer CIDR to non-responders & heat detect and AI days 9 to 12. TAI non-responders 72 - 84 hr after CIDR removal with GnRH at AI. Protocol may be used in heifers.



FIXED-TIME AI (TAI)*

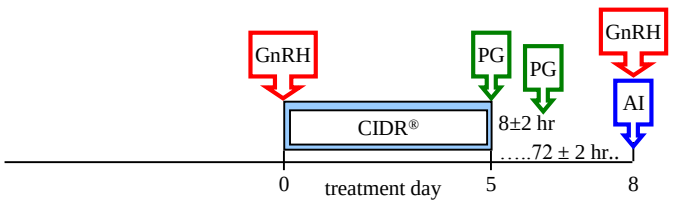
7-day CO-Synch + CIDR®

Perform TAI at 60 to 66 hr after PG with GnRH at TAI.



5-day CO-Synch + CIDR®

Perform TAI at 72 ± 2 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.

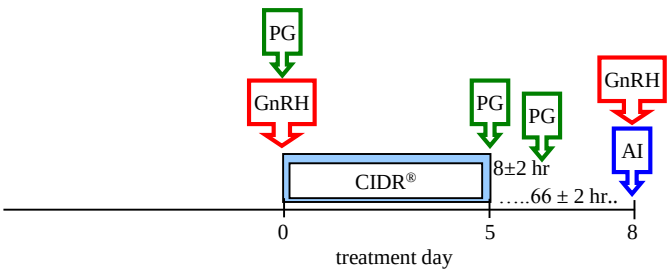


FIXED-TIME AI (TAI)*

for *Bos Indicus* cows only

PG 5-day CO-Synch + CIDR®

Perform TAI at 66 ± 2 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.



* The time listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of cows to inseminate, labor, and facilities.

These protocol sheets were assembled by the ***Beef Reproduction Task Force***. Programs are intended to promote sustainable food production systems by the beef industry through sound reproductive management practices for replacement heifers and postpartum cows. The Beef Reproduction Task Force recommends working with a licensed veterinarian for proper use and application of all reproductive hormones. **Approved 8-28-18**.

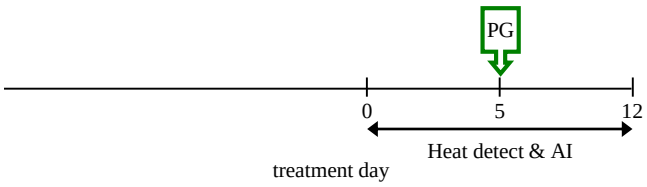
GnRH — Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®

PG — estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® *HighCon*, ProstaMate®, SYNCHSURE™

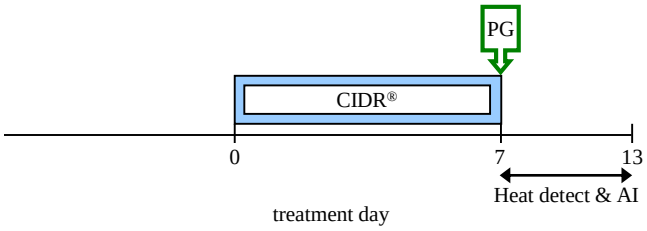
BEEF HEIFER PROTOCOLS - 2019

HEAT DETECTION

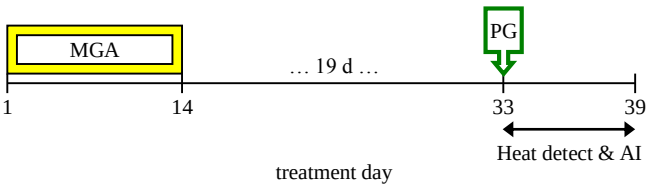
1 Shot PG



7-day CIDR®-PG



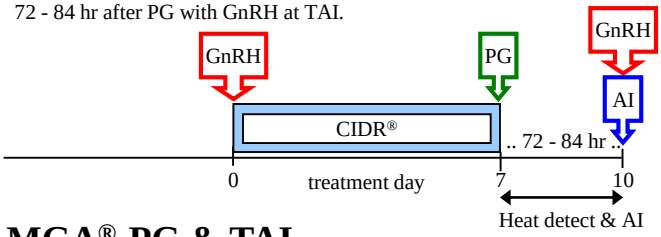
MGA®-PG



HEAT DETECT & TIME AI (TAI)

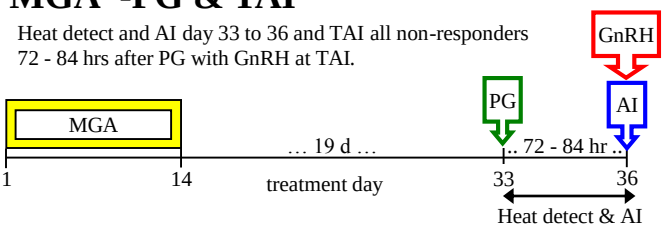
Select Synch + CIDR® & TAI

Heat detect and AI day 7 to 10 and TAI all non-responders
72 - 84 hr after PG with GnRH at TAI.



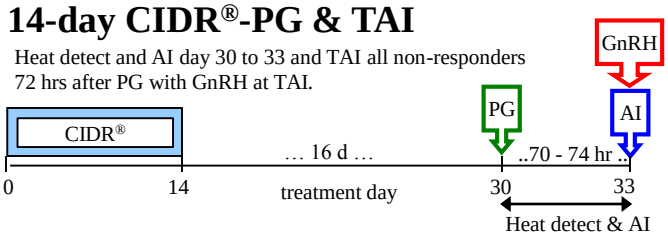
MGA®-PG & TAI

Heat detect and AI day 33 to 36 and TAI all non-responders
72 - 84 hrs after PG with GnRH at TAI.



14-day CIDR®-PG & TAI

Heat detect and AI day 30 to 33 and TAI all non-responders
72 hrs after PG with GnRH at TAI.

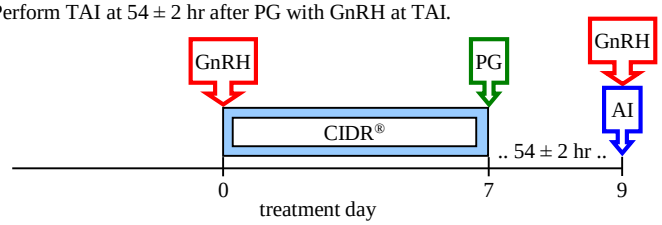


FIXED-TIME AI (TAI)*

Short-term Protocols

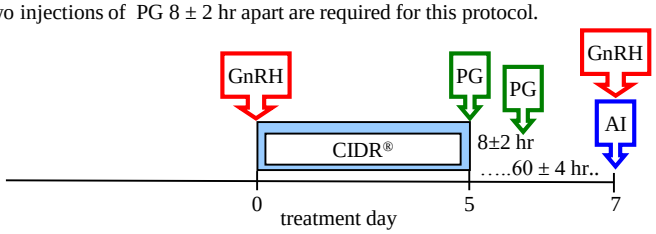
7-day CO-Synch + CIDR®

Perform TAI at 54 ± 2 hr after PG with GnRH at TAI.



5-day CO-Synch + CIDR®

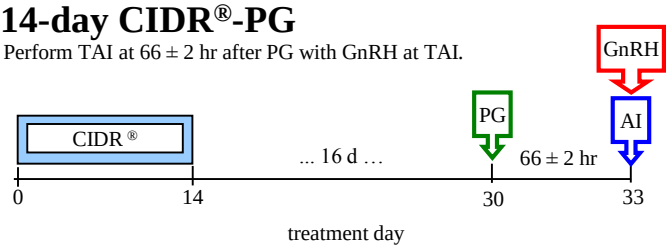
Perform TAI at 60 ± 4 hr after CIDR removal with GnRH at TAI.
Two injections of PG 8 ± 2 hr apart are required for this protocol.



Long-term Protocols

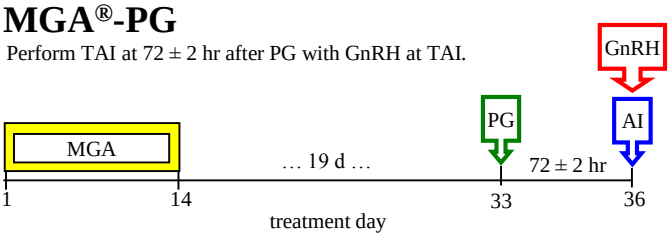
14-day CIDR®-PG

Perform TAI at 66 ± 2 hr after PG with GnRH at TAI.



MGA®-PG

Perform TAI at 72 ± 2 hr after PG with GnRH at TAI.



***** The times listed for "Fixed-time AI" should be considered as the approximate average time of insemination. This should be based on the number of heifers to inseminate, labor, and facilities.

These protocol sheets were assembled by the ***Beef Reproduction Task Force***. Programs are intended to promote sustainable food production systems by the beef industry through sound reproductive management practices for use in replacement heifers and postpartum cows. The Beef Reproduction Task Force recommends working with a licensed veterinarian for proper use and application of all reproductive hormones. **Approved 8-28-2018**.

GnRH: Cystorelin®, Factrel®, Fertagyl®, OvaCyst®, GONABreed®

PG: estroPLAN®, Estrumate®, In-Synch®, Lutalyse®, Lutalyse® *HighCon*, ProstaMate®, SYNCHSURE™

DCRC
DAIRY CATTLE REPRODUCTION COUNCIL

"Helping farmers optimize fertility in dairy cattle"

Reproductive Management Strategies for Dairy Cows

Detection of estrus followed by timed AI

For herds with efficient and accurate estrus-detection systems

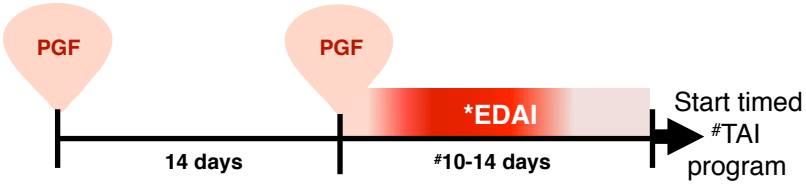
Definitions and comments:

EDAI = Estrous detection followed by AI
***Start** and **stop dates** for EDAI depend on voluntary waiting period **(VWP)** and the reproductive goals of the each herd

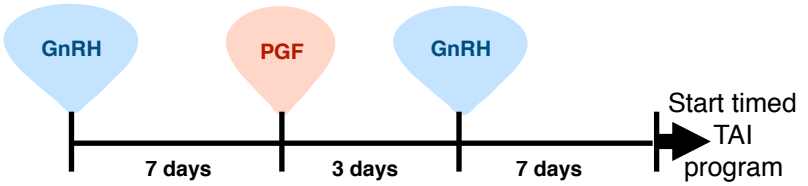
Presynchronization methods used before TAI

Used with TAI programs below to increase pregnancy per AI (P/AI). Can be used with or without EDAI

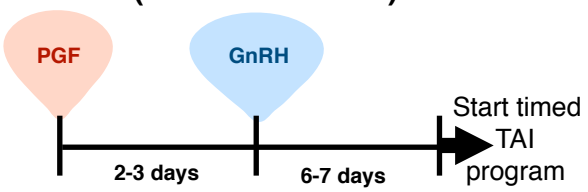
A. "PreSynch" (2xPGF - TAI)



B. "Double OvSynch" (GnRH-PGF-GnRH - TAI)



C. "G-6-G" (PGF-GnRH - TAI)



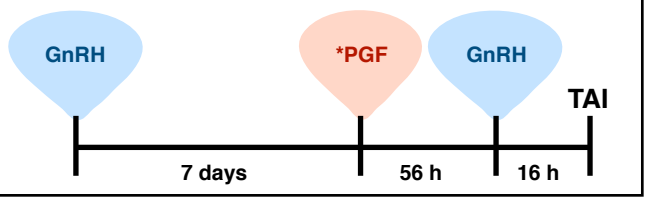
Definitions and comments:

PGF = Prostaglandin $F_{2\alpha}$
GnRH = Gonadotropin-releasing hormone
***Intensity of color in EDAI** denotes period (2-7 days) to expect most cows in estrus; **#TAI** program starting 10-12 days after PGF results in higher fertility

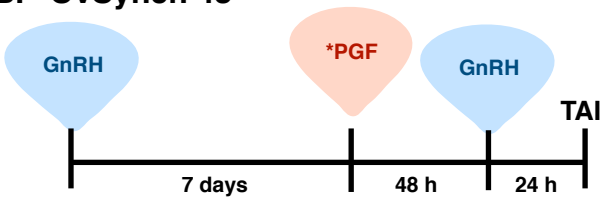
Synchronization methods for TAI

Can be used alone or with presynchronization (see above), and with or without EDAI detection. Presynchronization increases fertility. The use of the CIDR benefits fertility of cows with no CL starting TAI.

A. "OvSynch 56"

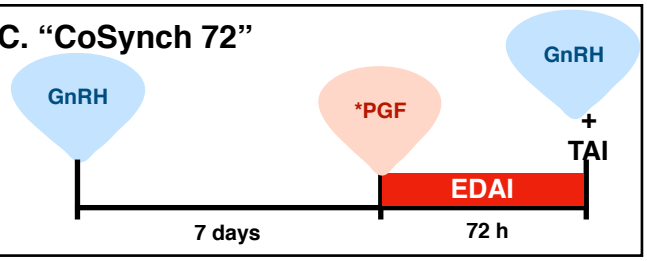


B. "OvSynch 48"

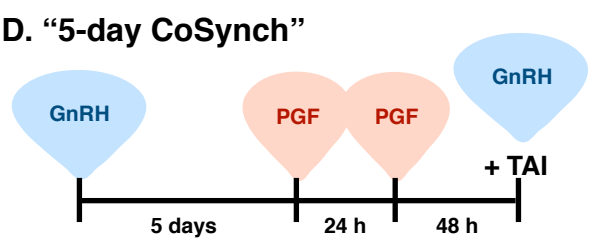


CIDR can be used in any program being inserted at 1st GnRH and removed at PGF

C. "CoSynch 72"



D. "5-day CoSynch"



**A second PGF 24 h after the first PGF improves luteolysis and fertility*

DCRC
DAIRY CATTLE REPRODUCTION COUNCIL

"Helping farmers optimize fertility in dairy cattle"

Reproductive Management Strategies for Dairy Cows

Presynchronization-Synchronization Calendars

Calendars are examples of presynchronization-synchronization combinations that are used for insemination. Any presynchronization can be used with a synchronization program. Any cow showing estrus after VWP can be inseminated.

A. "PreSynch-OvSynch"

MON	TUE	WED	THU	FRI
		PGF (AM)		
		PGF (AM)		
GnRH (AM)				
PGF (AM)		GnRH (PM)	TAI	

B. "Double-OvSynch"

MON	TUE	WED	THU	FRI
				GnRH (AM)
				PGF (AM)
GnRH (AM)				
GnRH (AM)				
PGF (AM)		GnRH (PM)	TAI	

C. "G-6-G-OvSynch"

MON	TUE	WED	THU	FRI
PGF (AM)		GnRH (AM)		
	GnRH (AM)			
	PGF (AM)		GnRH (PM)	TAI

The reproductive efficiency may differ between the programs listed above. Specific research data should be considered to determine the program that is optimal for use on a particular dairy farm.

Resynchronization programs

Any cow that is diagnosed open at pregnancy diagnosis (PD) can be resynchronized. Methods can be used with or without estrous detection and after the observed estrus (EDAI). Presence or absence of corpus luteum is a criterion to be considered with your veterinarian or reproductive specialist when selecting a program to be used.

***Intensity of color** within EDAI indicates intensity of estrus. Open cows could be in estrus 18-25 days after AI. **PGF** is given to cows diagnosed open. Pregnant cows are not treated. CIDR can be used in Resynch program as described in page 1

A. Start TAI program after PD

Start TAI program on cows diagnosed open at PD

Example: OvSynch 56 starting after PD

MON	TUE	WED	THU	FRI
PD + GnRH (AM)				
PGF (AM)		GnRH (PM)	TAI	

B. Start TAI program before PD

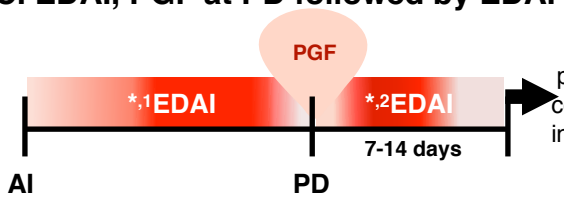
Start TAI program on cows diagnosed open at PD

Example: OvSynch 56 starting before PD

MON	TUE	WED	THU	FRI
GnRH (AM)				
PD + PGF (AM)		GnRH (PM)	TAI	

PGF is given to cows diagnosed open. Pregnant cows are not treated.

C. EDAI, PGF at PD followed by EDAI & TAI for cows not re-inseminated



Start TAI program on cows not re-inseminated

Example: PGF followed EDAI & OvSynch 56

MON	TUE	WED	THU	FRI
PD + PGF (AM)				
GnRH (AM)				
PGF (AM)		GnRH (PM)	TAI	

Intensity of color indicates intensity of estrus. [1]Open cows could be in estrus 18-25 days after AI. [2]Cows come in estrus 2-7 days

Compliance table: The following table shows the percentage of cows receiving all treatments as a function of compliance at an individual treatment. For example, if 95 of 100 cows receive their treatment on any given day the herd has 95% compliance. To achieve the greatest P/AI herds have to strive for 100% compliance.

Compliance	3 treatments program	7 treatments program
100%	100%	100%
95%	86%	70%
90%	73%	48%

Note: This reproductive management sheet was assembled by the Dairy Cattle Reproductive Council (DCRC). Programs are intended to promote sustainable food production through sound dairy practices. The DCRC recommends working with a licensed veterinarian for the proper administration of all treatments.

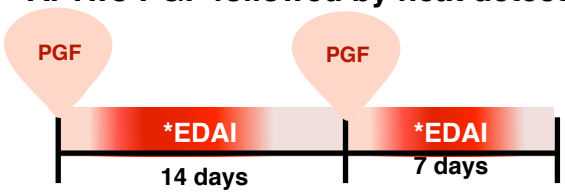
DCRC
DAIRY CATTLE REPRODUCTION COUNCIL

"Helping farmers optimize fertility in dairy cattle"

Reproductive Management Strategies for Dairy Heifers

Artificial insemination after detection of estrus

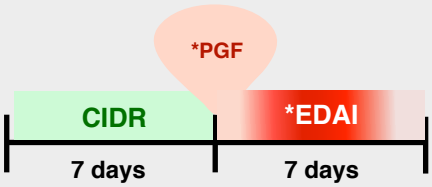
A. Two PGF followed by heat detection



Definitions and comments:

PGF = Prostaglandin $F_{2\alpha}$. ***Intensity of color in EDAI** indicates estrus intensity. Most heifers are in estrus 2-7 days after PGF. Approximately 70% of the heifers will be in estrus in the first 14 days after the first PGF. The remaining heifers should be in estrus after the second PGF. Non-responding heifers might be prepubertal. TAI can be used to provide a breeding opportunity of heifers not detected in estrus

B. CIDR program with PGF at removal



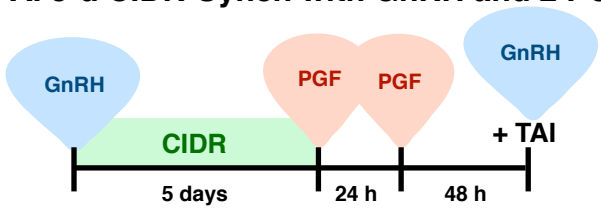
Definitions and comments:

CIDR = Controlled internal drug release. Approximately 70% of heifers should be in estrus during 7 days after the CIDR removal. Non responding heifers may be prepubertal. CIDR-based programs may induce fertile entrees in some prepubertal heifers. ***PGF** can be given on day 6 instead of 7 (One day before CIDR removal) to increase synchrony of estrus in the program

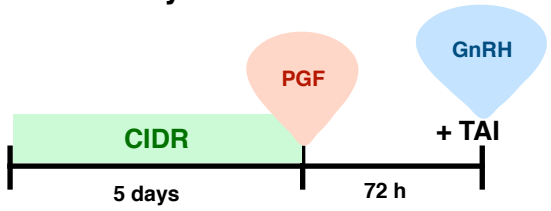
Programs for timed AI

GnRH = Gonadotropin-releasing hormone.
For the timed AI program presented below, the option A yields greater number of pregnancies per insemination than option B

A. 5-d CIDR-Synch with GnRH and 2 PGF



B. 5-d CIDR-Synch without GnRH and 1 PGF



Calendar options

A. Two PGF followed by heat detection

SUN	MON	TUE	WED	THU	FRI	SAT
	PGF	EDAI	EDAI	EDAI	EDAI	EDAI
EDAI	EDAI	EDAI	EDAI	EDAI	EDAI	EDAI
EDAI	PGF	EDAI	EDAI	EDAI	EDAI	EDAI
EDAI	EDAI					

B. CIDR program with PGF at removal

SUN	MON	TUE	WED	THU	FRI	SAT
	CIDR	CIDR	CIDR	CIDR	CIDR	CIDR
CIDR	CIDR PGF	EDAI	EDAI	EDAI	EDAI	EDAI
EDAI	EDAI					

C. 5-d CIDR-Synch with GnRH and 2 PGF

SUN	MON	TUE	WED	THU	FRI	SAT
			CIDR GnRH	CIDR	CIDR	CIDR
CIDR	CIDR PGF	PGF		GnRH TAI		

Note: This reproductive management sheet was assembled by the Dairy Cattle Reproductive Council (DCRC). Programs are intended to promote sustainable food production through sound dairy practices. The DCRC recommends working with a licensed veterinarian for the proper administration of all treatments.

Extension
UNIVERSITY OF WISCONSIN–MADISON

Artificial Insemination Program

Summary of Semen Handling

- Be sanitary
- Heat water bath to 95-98^{0}F
- Put safety glass on for safety when dealing with liquid nitrogen
- Remove semen from tank – keeping canister below the neck line, only pull cane into neck
- Place semen in preheated thaw unit
- Thaw time ¼ cc straw – 20 seconds, ½ cc straw – 40 seconds, 15 minutes max
- Attempt to have A.I. gun at or near body temperature
- Remove straw to a paper towel to dry and protect it from the sunlight
- Cut end from straw, put straw in sheath, keeping straw wrapped in paper towel
- Place sheath on A.I. gun and lock it in position
- Protect gun from adverse temperature to prevent temperature shock by putting between coveralls and shirt
- Proceed to confined cow, empty rectum and clean vulva
- Place gun in vagina without touching vulva
- Pass A.I. gun through cervix
- Deposit semen just past cervix in the uterine body. Count to five when depositing semen
- Withdraw gun
- Check semen straw for identification
- Dispose of sheath, gloves, and straw after recording breeding information from straw.

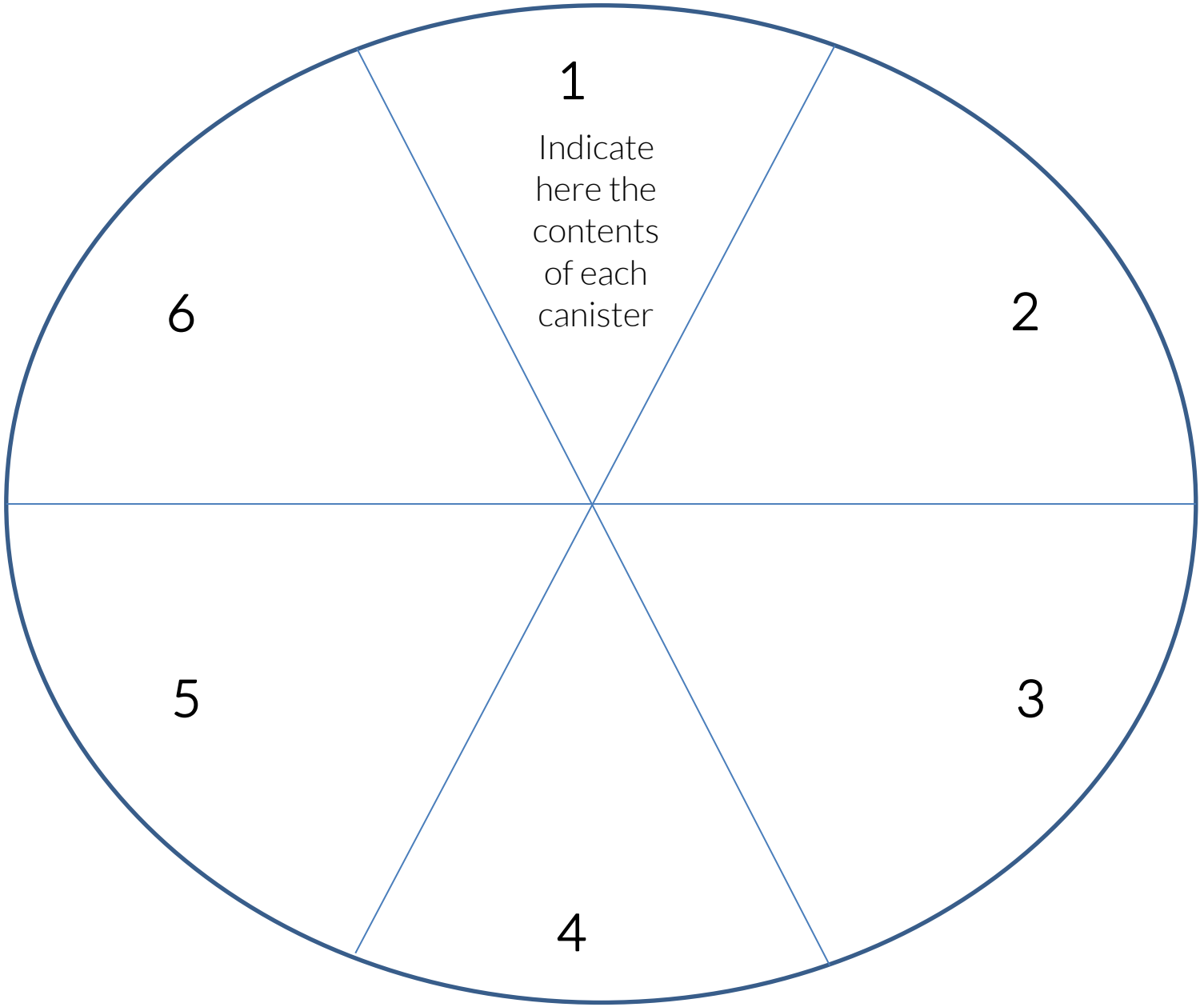
Remember you have 15 minutes from the time you remove the semen from the tank to breed the cow.

Words of Caution:

- If you remove semen and place it back in the tank within 50-55 seconds the semen will have 0% motility.
- Most semen straws only take 30 seconds out of liquid nitrogen and back in to have noticeable depression in motility.
- If only removed for 8 seconds there is no noticeable damage, but repeated removal will cause effects.

Tank inventory Sheet

Date Purchased	Code No.	Name	Canister No.	No. of units	Units Used



Extension
UNIVERSITY OF WISCONSIN–MADISON

Extension
UNIVERSITY OF WISCONSIN–MADISON

Artificial Insemination Program

Origin and the function of the main hormones involved in the cow reproductive cycle

Hormone	Origin	Function
GnRH: Gonadotropin Releasing Hormone	Hypothalamus	Stimulation of the release of FSH and LH
FSH: Follicle Stimulating Hormone	Pituitary Gland	Follicular growth and production
LH: Lutenizing Hormone	Pituitary Gland	Final maturation of follicle ovulation, CL formation
Estrogens	Ovaries (Follicles)	Growth of uterus, estrus behavior, cervical mucus secretion, release of LH for ovulation
Progesterone	Ovaries (CL)	Maintains pregnancy, keeps cow from ovulating
Oxytocin	Ovaries (CL, Pituitary)	Milk excretion and prostaglandin synthesis
Prostaglandin	Uterus	Lysis of CL

Extension
UNIVERSITY OF WISCONSIN–MADISON

Artificial Insemination Program

Compare the fertility rates on your farm to the following goals

Herd fertility goals for Dairy:

- Pregnancy rate > 20%
- Heat detection rate > 65%
- Conception rate (all cows) > 30%
- Percent bred by 90 days in milk > 98%
- Percent pregnant by 150 days in milk >85%

Beef (Combination of A.I. and Natural Service):

- Pregnancy rate > 85%
- Heat detection rate > 80%
- Conception rate to 1st service A.I. >50%
- Percent pregnant – 1st 30 days of breeding season > 50%
- Percent pregnant – 1st 60 days of breeding season > 80%

Low conception rates can be caused by a variety of factors including:

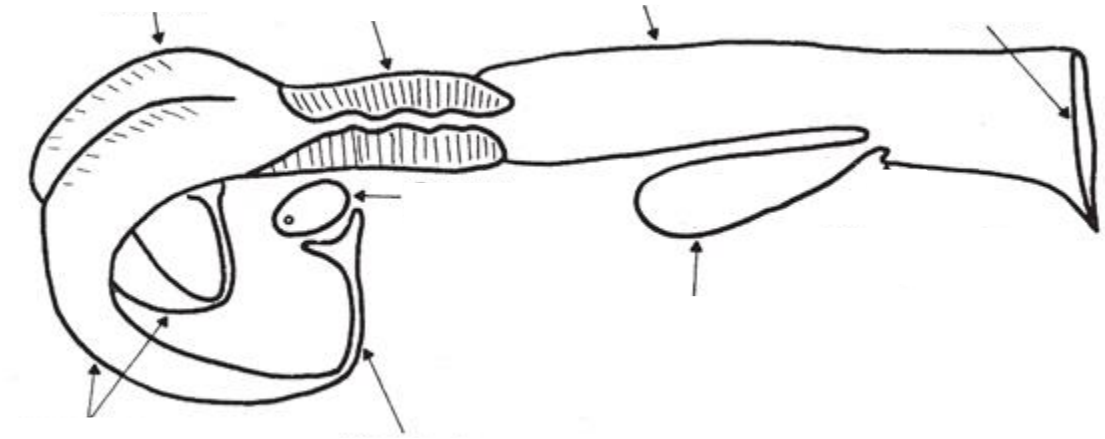
1. Semen quality: validate that semen damage hasn't occurred during on farm storage by having a straw thawed and examined under dark field microscopy.
2. AI Technique: must be clean, gentle, and semen placement must be at the target zone.
3. Cows must have nutritionally balanced rations, a moderate to good body condition score, and a 50 to 60 day voluntary waiting period between calving and breeding.
4. Work with your veterinarian to ensure your cattle are free of reproductive diseases like vibriosis, trichomoniasis, leptospirosis, brucellosis and bovine viral diarrhea.

Artificial Insemination Examination – Post Test

Name: _____

1. Label the following parts of the female reproductive tract

Uterine Horn	Cervix	Vagina	Ovary
Vulva	Bladder	Uterus	Oviduct



2. List three signs a female is in heat.

3. Eggs are produced by the ovaries. Do both ovaries release eggs in each estrus cycle? Explain.

4. Why is it important to place the semen in the uterine body?

5. What are three reasons for determining pregnancy status?

6. What are two choices available for pregnancy diagnosis?

7. List 2 tools you can use for detecting heat.

8. T/F Pregnancy synchronization protocols work 100% of the time?
9. T/F Synchronization protocols are different for Beef and Dairy animals?
10. T/F The purpose of estrus synchronization is to bring a group of females into estrus at the same time.

Extension
UNIVERSITY OF WISCONSIN–MADISON

Artificial Insemination Program Evaluation

1. Circle the appropriate number to indicate your degree of understanding of the topics listed.

	My understanding							
	Before Training				*After Training*			
	Very Little	Some	Quite a Bit	A Lot	Very Little	Some	Quite a Bit	A Lot
Reproductive Anatomy and Physiology	1	2	3	4	1	2	3	4
AI Technique	1	2	3	4	1	2	3	4
Reproductive tracts and semen Handling	1	2	3	4	1	2	3	4
AI Equipment	1	2	3	4	1	2	3	4
Heat Detection	1	2	3	4	1	2	3	4
Estrus Synchronization	1	2	3	4	1	2	3	4
Bull Selection	1	2	3	4	1	2	3	4
Pregnancy Detection	1	2	3	4	1	2	3	4
Blood Draw Technique	1	2	3	4	1	2	3	4

2. Please rate the topic on its value to you (1 = poor and 5 = excellent).

	Topic				
Reproductive Anatomy and Physiology	1	2	3	4	5
AI Technique	1	2	3	4	5
Reproductive tracts and semen Handling	1	2	3	4	5
AI Equipment	1	2	3	4	5
Heat Detection	1	2	3	4	5
Estrus Synchronization	1	2	3	4	5
Bull Selection	1	2	3	4	5
Pregnancy Detection	1	2	3	4	5
Blood Draw Technique	1	2	3	4	5
AI Practice in Cows	1	2	3	4	5

3. What did you gain from this program? (Check all that apply)

___ Answers to my questions
___ Resource materials I can use
___ Ideas I can try immediately
___ Names of other people to contact
___ Nothing new
Anything else? _____

4. How do you plan to use the information from the program?

5. Are there any topics you feel should be added in the future?

THANK YOU AND HAVE A SAFE DRIVE HOME