ARTIFICIAL INSEMINATION

Training Manual

Alta

INDEX

WHAT IS ARTIFICIAL INSEMINATION?

Artificial Insemination (AI) is the instrumental technique used to deposit semen into the body of the uterus of a female in estrus, or heat, to obtain a pregnancy.

ADVANTAGES OF USING AI

Genetic Improvement	Creates opportunities to use genetically superior bulls
Disease Mitigation	Eliminates sexually transmitted disease risk and improves hygiene
Safety	Removes herd bulls that pose danger for cows and people
Management	Known breeding and due dates create timely, efficient pen moves
Economics	Save cost for feed, transportation, housing, and health of actual bulls

FACTORS THAT AFFECT AI PERFORMANCE

Animal Records

Nutrition

Technicians

Management

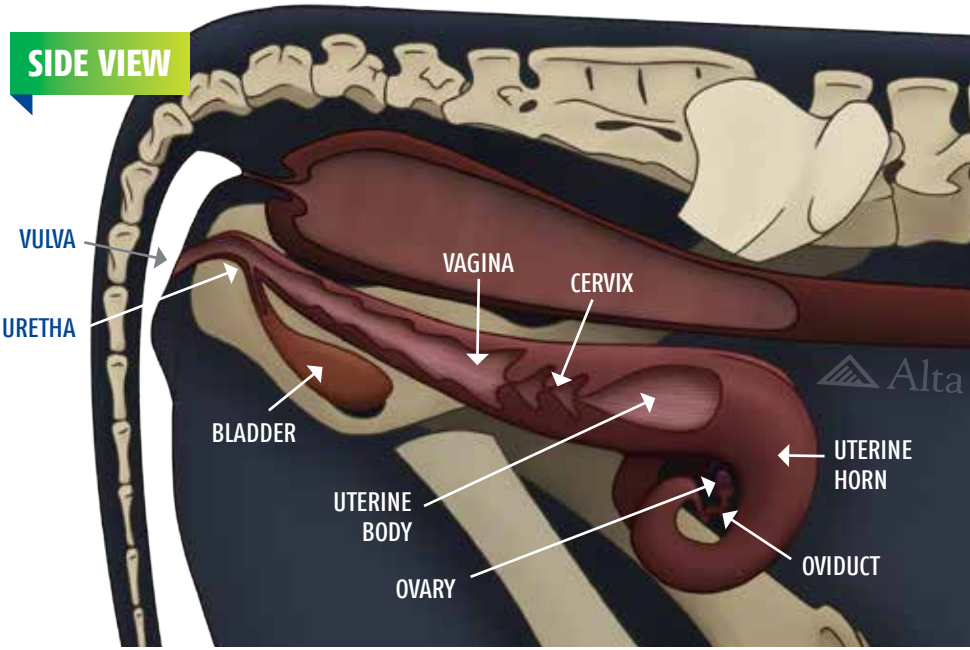
Heat Detection

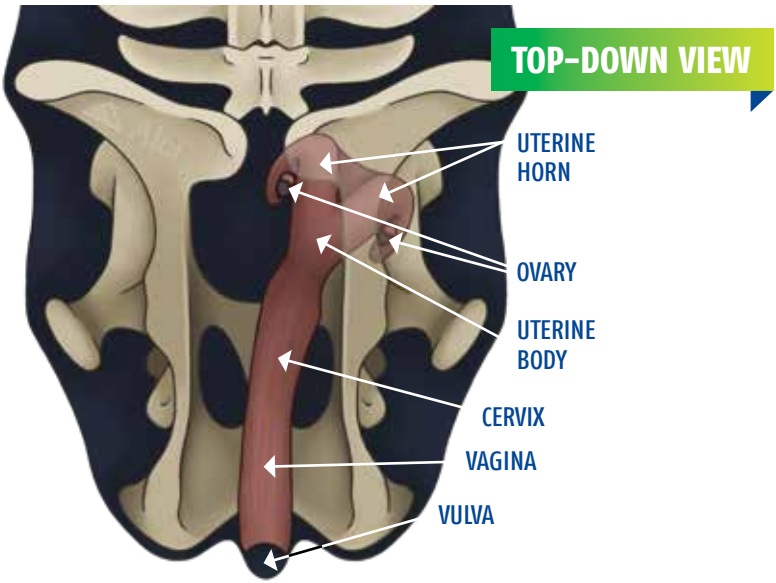
Facilities

Herd Health

REPRODUCTIVE ANATOMY OF THE COW

REPRODUCTIVE ANATOMY OF THE COW

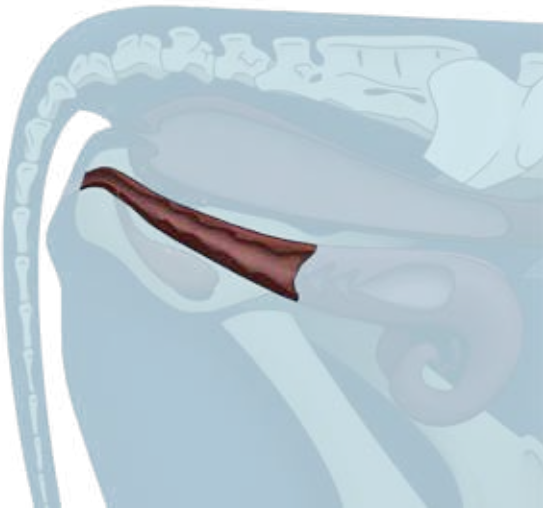




REPRODUCTIVE ANATOMY OF THE COW

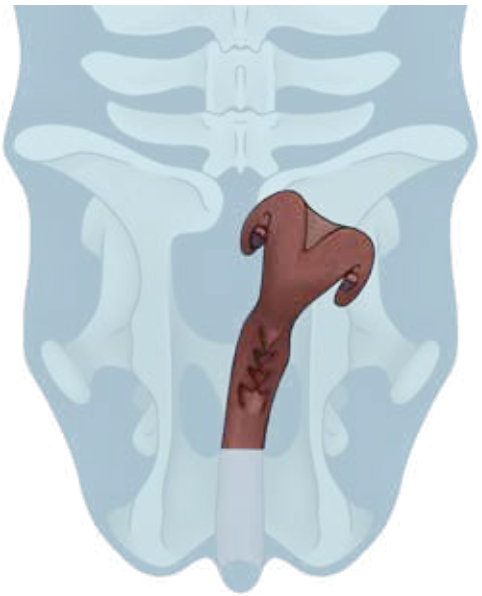
VAGINA

- Connects the vulva to the cervix
- During natural service, it receives the male penis



UTERUS

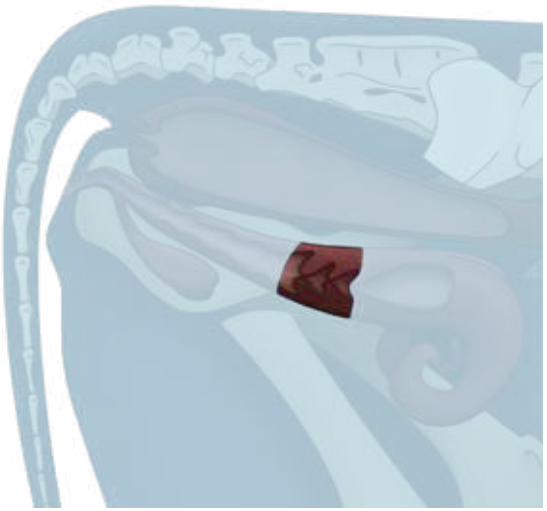
- Feeds, protects, and shelters the fetus until calving.
- It consists of 3 parts:
  - Cervix
  - Body of the uterus
  - 2 uterine horns



REPRODUCTIVE ANATOMY OF THE COW

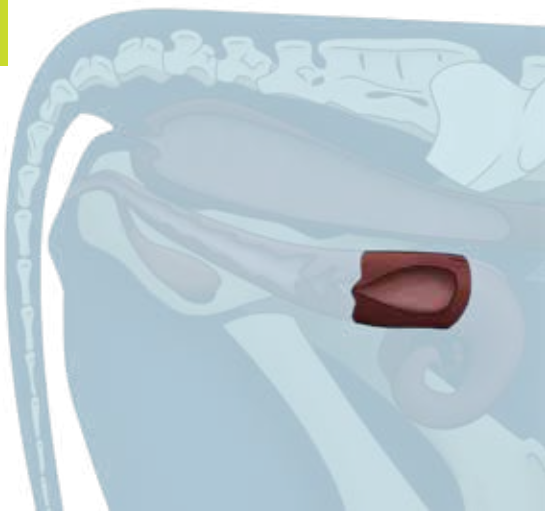
CERVIX

- 1–5 inches long and 1–3 inches in diameter
- Made of fibrous tissue, which is dense and hard to the palpation
- Position may vary with age of cow



UTERINE BODY

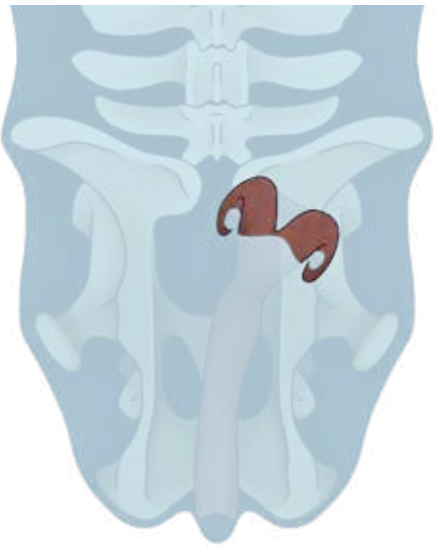
- Located anterior to the cervix
- Target site for semen deposit in AI
- Made of soft tissue and is usually 1 inch long



REPRODUCTIVE ANATOMY OF THE COW

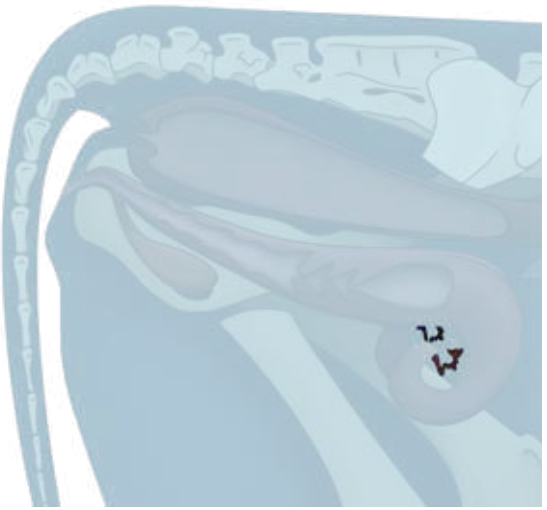
UTERINE HORNS

- One left horn and one right horn
- Each horn is 8–16 inches long
- They are connected to their respective ovaries through the fallopian tubes or oviducts.



OVIDUCTS

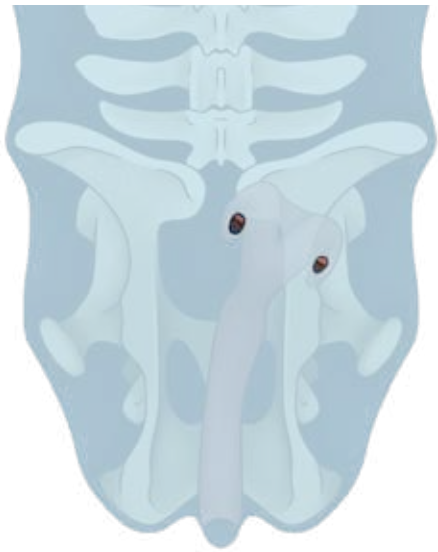
- Tubes that connect the ovaries with uterine horns
- Fertilization site between ovum and sperm cells



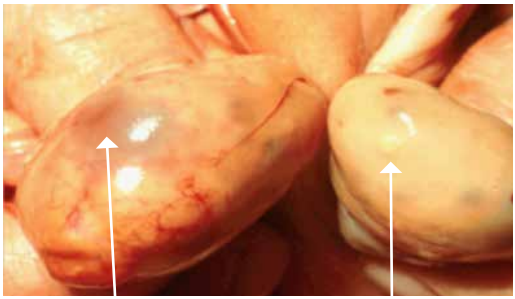
REPRODUCTIVE ANATOMY OF THE COW

OVARIES

- Approximately 1.5 inches long, 1 inch width, and ½ inch thick
- Main function is to produce eggs and secrete hormones like estrogens and progesterone.



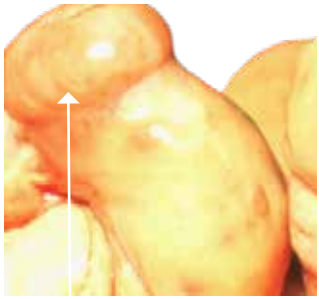
OVARIES – Follicles



Dominant Follicle

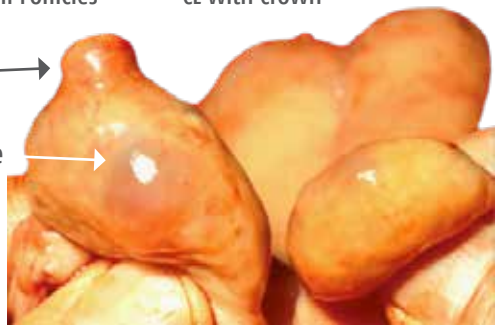
Small Follicles

OVARIES – Corpus Luteum (CL)



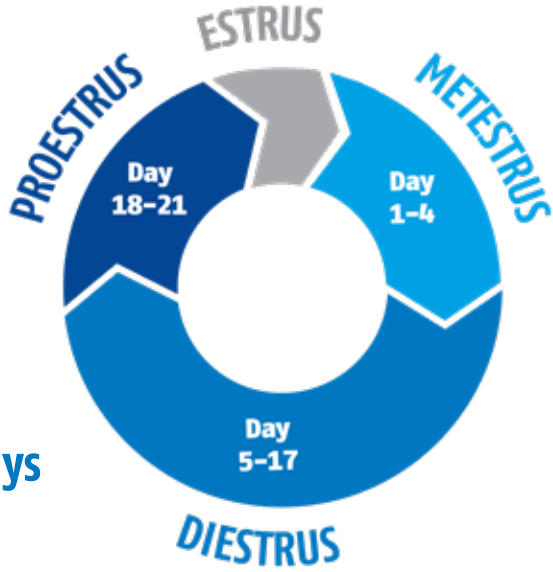
CL with crown

- You'll see a regressing CL and dominant follicle on the same ovary.



ESTRUS CYCLE BASICS & PHYSIOLOGY

STAGES OF THE ESTRUS CYCLE



The average estrus cycle lasts 18–24 days

Acronyms Related to Estrus

GnRH	Gonadotropin releasing hormone
LH	Luteinizing hormone
FSH	Follicle stimulating hormone
$PGF_{2\alpha}$	Prostaglandin
CL	Corpus luteum

STAGES OF THE ESTRUS CYCLE

ESTRUS

- Estrus is also known as being in heat
- The 12 to 18 hours of maximum sexual receptivity

HORMONES of estrus

1. The dominant follicle releases estradiol
2. Estradiol increases in the bloodstream, which causes:
   i. GnRH release from the hypothalamus &
   ii. A surge of LH is from the anterior pituitary
3 . This causes the cow begins showing estrus signs.
4. Ovulation occurs 12 to 16 hours after the end of the estrus.

METESTRUS

- Lasts 4–6 days
- Begins after ovulation, when the CL forms

HORMONES of metestrus

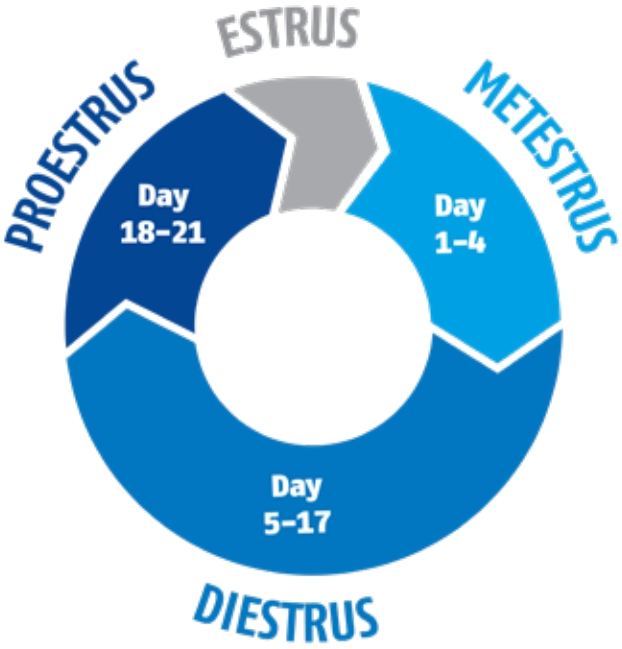
If the cow becomes pregnant:

- The CL continues to produce progesterone, which maintains the pregnancy.

If the cow does not become pregnant:

- LH and Progesterone secreted by the CL inhibit follicle stimulating hormone released by the pituitary gland.
- During this phase, the CL is not responsive to prostaglandin.

STAGES OF THE ESTRUS CYCLE



DIESTRUS

- Lasts 12 – 13 days

HORMONES of diestrus

- A mature CL is established which means this stage is controlled by progesterone.
- If the cow is open, the uterus releases $PGF_{2\alpha}$ on day 16
- The $PGF_{2\alpha}$ causes the CL to regress

PROESTRUS

- Lasts 3 –4 days
- Occurs right before a behavioral estrus

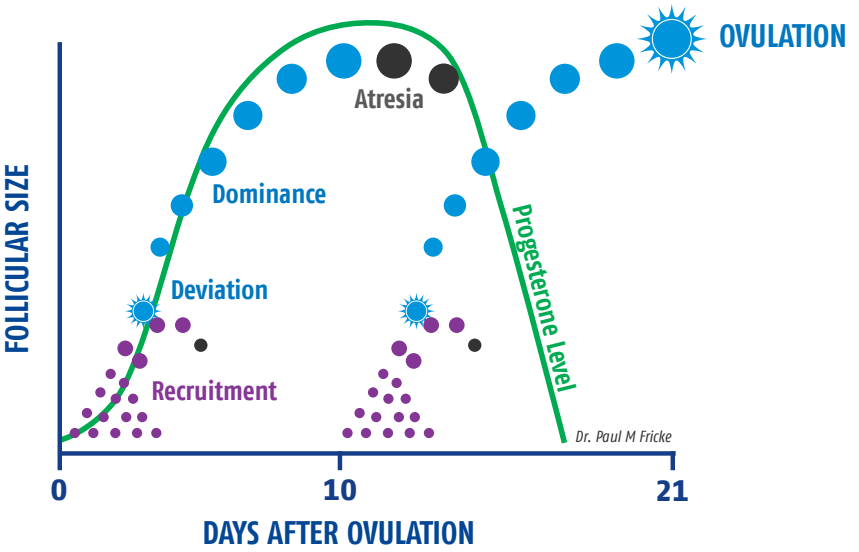
HORMONES of proestrus

- After the CL regresses, the hypothalmus and pituitary gland release a new surge of GnRH, FSH, and LH
- This surge causes growth of a dominant follicle, which triggers the next behavioral estrus and ovulation

HORMONAL REGULATION

Hormones	Origin	Function
GnRH	Hypothalamus	Stimulates FSH and LH release
FSH	Pituitary gland	Follicular growth and production
LH	Pituitary gland	Final maturation of follicle, ovulation, CL formation
Estrogen	Ovaries (Follicle)	Growth of uterus, estrus behavior, cervical mucus secretion, release of LH for ovulation
Oxytocin	Ovaries (CL, pituitary)	Milk letdown and prostaglandin synthesis
Prostaglandin	Uterus (endometrium)	Regression or Lysis of CL
Progesterone	Ovaries (CL)	Maintains pregnancy

FOLLICULAR WAVES



HYPOTHALAMIC–PITUITARY–OVARIAN AXIS

ESTRUS DETECTION

THE PRIMARY SIGN OF ESTRUS

SECONDARY SIGNS OF ESTRUS

- Tail paint or chalk rubbed off
- Ruffled hair on the tailhead
- A swollen vulva
- Seeing mucus on the tail or on the rear flank
- The inside of the vulva is red and slippery
- Mounting other cows
- Aggressive, restless behavior
- Records indicating a normal estrus cycle

HEAT DETECTION AIDS

Alta COW WATCH

Repro, health & welfare

Alta COW WATCH automatically tracks signs of estrus 24 hours a day to improve your herd's repro results.

The system gives you an individual alert plus a clear list of all cows in heat. The list will tell you each cow's optimal moment to inseminate for the highest chance of conception. It also provides additional repro insights to help you to identify cows with irregular heats, non-cycling cows and non-pregnant cows.

Tail Paint & Chalk Technique

- Each cow should receive one chalk stripe per day
- Paint 2 inches behind pin bones to tail head tip in a ¾-inch thick stripe
- Chalk should appear uniform, so you can notice even slight signs of estrus
- Improper paint or chalk will lead to false positives and missed heats

Other aids

- Kamar
- Estrotect

ESTRUS SYNCHRONIZATION

HORMONES FOR ESTRUS SYNCHRONIZATION

GnRH

- Causes the dominant follicle to grow and ovulate
- Only effective during the follicular phase of the heat cycle
- Names of GnRH products: Cystorelin, Factrel, Fertagyl, Receptal, Gonabreed

Prostaglandin

- Causes CL regression and the onset of a new heat
- Only effective during the luteal phase of the heat cycle
- Names of $PGF_{2\alpha}$ products: Synchsure, Lutalyse, Estrumate, Estroplan

ESTRUS SYNCHRONIZATION PROGRAMS

Ovsynch

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	GnRH AM					
	$PGF_{2\alpha}$ AM		GnRH PM	**TAI** AM		

Ovsynch with Extra $PGF_{2\alpha}$

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	GnRH AM					
	$PGF_{2\alpha}$ AM	$PGF_{2\alpha}$ AM	GnRH PM	**TAI** AM		

↑

Adding this optional extra prostaglandin will help with luteal regression and boost conception in any of the ovsynch programs

ESTRUS SYNCHRONIZATION PROGRAMS

Presynch-Ovsynch 14-14

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	$PGF_{2\alpha}$ AM		Estrus	Estrus	Estrus	
	$PGF_{2\alpha}$ AM		Estrus	Estrus	Estrus	
	GnRH AM					
	$PGF_{2\alpha}$ AM		GnRH PM	**TAI** AM		

Presynch-Ovsynch 14-11.5

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
			$PGF_{2\alpha}$ PM		Estrus	Estrus
Estrus						
			$PGF_{2\alpha}$ PM		Estrus	Estrus
Estrus		11.5 DAYS				
	GnRH AM					
	$PGF_{2\alpha}$ AM		GnRH PM	**TAI** AM		

ESTRUS SYNCHRONIZATION PROGRAMS

Double-Ovsynch

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
					GnRH AM	
					$PGF_{2\alpha}$ AM	
	GnRH AM					
	GnRH AM					
	$PGF_{2\alpha}$ AM		GnRH PM	TAI AM		

10 day Cosynch

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	GnRH					
	$PGF_{2\alpha}$			GnRH + TAI AM		

ESTRUS SYNCHRONIZATION PROGRAMS

G6G

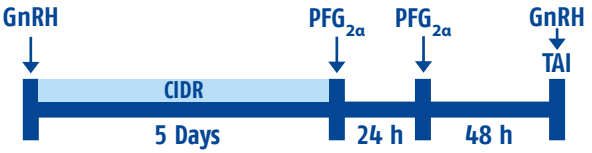
Sun	Mon	Tues	Wed	Thurs	Fri	Sat
$PGF_{2\alpha}$ AM		GnRH AM				
	GnRH AM					
	$PGF_{2\alpha}$ AM		GnRH P M	**TAI** AM		

OvSynch 56 – CIDR Synch

- Cattle will be in estrus 1–3 days after CIDR removal

5 Day – CIDR Synch

- Used more commonly in heifers
- Cattle will be in estrus 1–3 days after CIDR removal



AI EQUIPMENT & SEMEN HANDLING

THE SEMEN TANK

A. Durable, tamper-proof cap with locking tab

B. Easy maintenance lid with color-coded canister number system

C. Superior strength, lightweight aluminum exterior

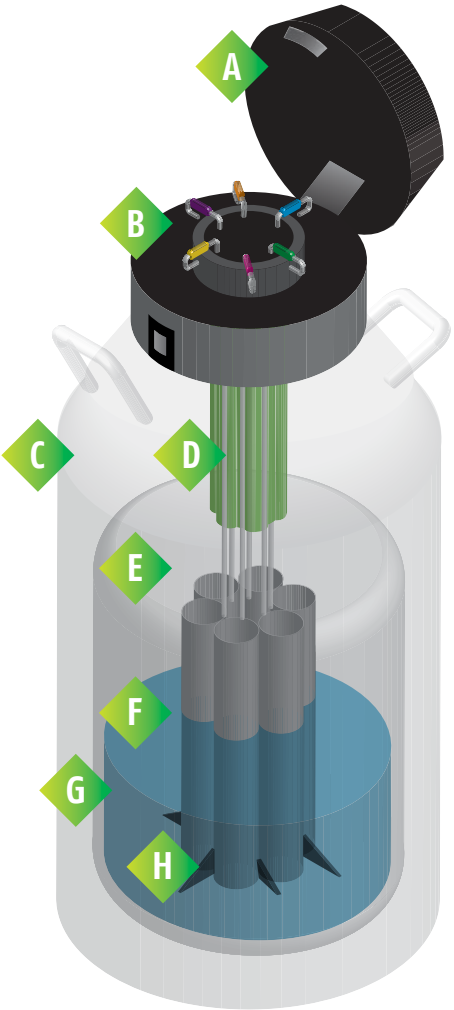
D. High strength neck tube reduces LN2 loss

E. Advanced chemical vacuum retention

F. Liquid nitrogen reservoir

G. Semen tank insulation *needs to maintain a temp of -320°F (-196°C)*

H. Spider design for easy retrieval and insertion of canister



SEMEN TANK MANAGEMENT TIPS

Tank Storage/Handling

- Keep it in a clean, dry location, raised off the ground
- Store it in a location with easy access, so you avoid moving it too often
- When necessary, always carry it in vertical position
- Maintain an accurate inventory so it's always easy to find the straws you need
- Check the liquid nitrogen level regularly

SEMEN HANDLING TIPS

Before you begin thawing a unit of semen...

- Wash your hands
- Keep the thaw unit close to the semen tank
- Keep track of your inventory supply, so you don't run out of the supplies you need!
- Keep your supplies together in one place so you have easy access to what you need close by
- Know which cow(s) you'll be breeding, and ensure she is locked or properly restrained
- Know which semen you will need to use on that animal

EQUIPMENT YOU'LL NEED FOR AI

- Semen storage tank
- Semen thawing unit
- Thermometer
- Tweezers or forceps
- Straw cutter or scissors
- Timer
- Paper towels
- Lubricant
- AI Gun
- AI gun warmer
- Disposable plastic sheaths
- Disposable plastic gloves

THE SEMEN HANDLING PROCESS

with a gun warmer

1. Prepare thaw unit with clean water at a temp of **95-98° F | 35-37° C**
2. In the semen tank, locate the canister that holds the semen you need
3. Lift that canister, but keep it below frost line of the semen tank
4. Use tweezers to transfer straw from the tank to the thaw unit in < 5 seconds
5. Set a timer for 45 seconds
6. **Thaw the straw of semen for a minimum of 45 seconds at 95-98° F**
7. While the straw thaws, pre-warm your AI gun and disposable sheath by putting them in your gun warmer
8. After 45 seconds, remove semen from the thaw unit and dry the straw completely with a paper towel
9. Cut the sealed end of the straw squarely and cleanly
10. Insert the cut end of the straw into the sheath in your gun warmer and let it drop to the bottom
11. Remove AI gun from the warmer, insert it immediately into the disposable sheath, and secure the gun in place
12. Advance the AI gun plunger to remove any air space
13. Use this straw of semen to inseminate a cow within 10 minutes.

THE SEMEN HANDLING PROCESS

without a gun warmer

1. Prepare thaw unit with clean water at a temp of **95-98° F | 35-37° C**
2. In the semen tank, locate the canister that holds the semen you need
3. Lift that canister, but keep it below frost line of the semen tank
4. Use tweezers to transfer straw from the tank to the thaw unit in < 5 seconds
5. Set a timer for 45 seconds
6. **Thaw the straw of semen for a minimum of 45 seconds at 95-98° F**
7. While the straw thaws, pre-warm your AI gun and disposable sheath by putting them in your shirt.
8. After 45 seconds, remove semen from the thaw unit and dry the straw completely with a paper towel
9. Cut the sealed end of the straw squarely and cleanly
10. Place the plug end of the straw into the AI gun
11. Place a disposable sheath over the gun and secure it firmly with a twisting motion
12. Advance the AI gun plunger to remove any air space
13. Use this straw of semen to inseminate a cow within 10 minutes.

DO'S AND DON'TS OF SEMEN HANDLING

DO

If it's difficult to locate the straw of semen you need in the tank, put the canister back down, wait 15 seconds, then try again

Protect the straw from cold shock and sunlight

Inseminate the cow(s) as soon as possible after properly thawing a unit of semen

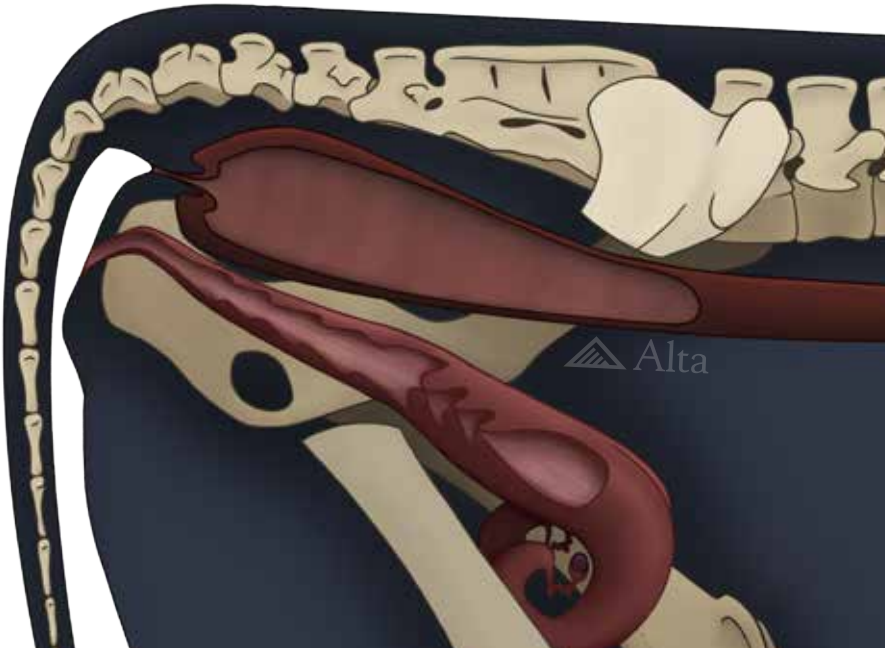
DO NOT

Do NOT thaw more than three straws at one time

Do NOT return thawed or partially thawed straws to the semen tank

INSEMINATION TECHNIQUE

NORMAL REPRO TRACT POSITION



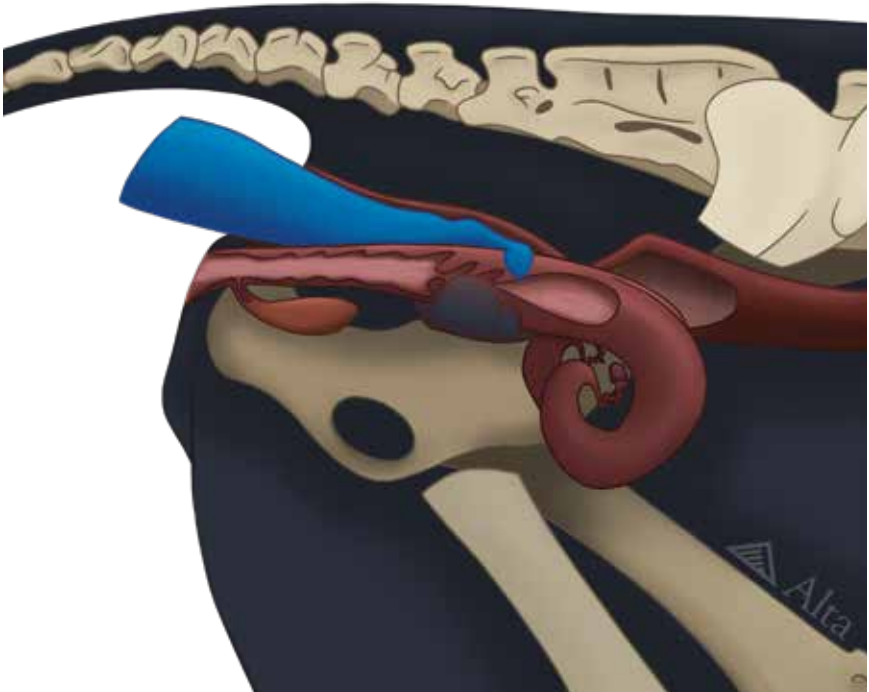
INSEMINATION TECHNIQUE

Before you begin...

- Make sure the cow you will breed is not already pregnant
- Make sure she is in heat
- Check her ID number and confirm with your breeding list

INSEMINATION TECHNIQUE

- Put a shoulder-length disposable plastic glove on your left arm
- Add a generous amount of lubricant to cover your glove
- Stand sideways behind the cow you will breed
- Form a cone with your fingers, and gently insert the hand through the rectal opening.
- Once your hand is fully in the rectum, open fingers from the cone position and remove fecal matter if needed.
- Avoid excessive arm motion which creates air in the rectum, which will not allow you to grasp the cervix.
- Gently slide the hand from the upper part of the rectum to the lower part to identify the cervix
- Hold the cervix with your thumb on the top and the rest of your fingers on the bottom.

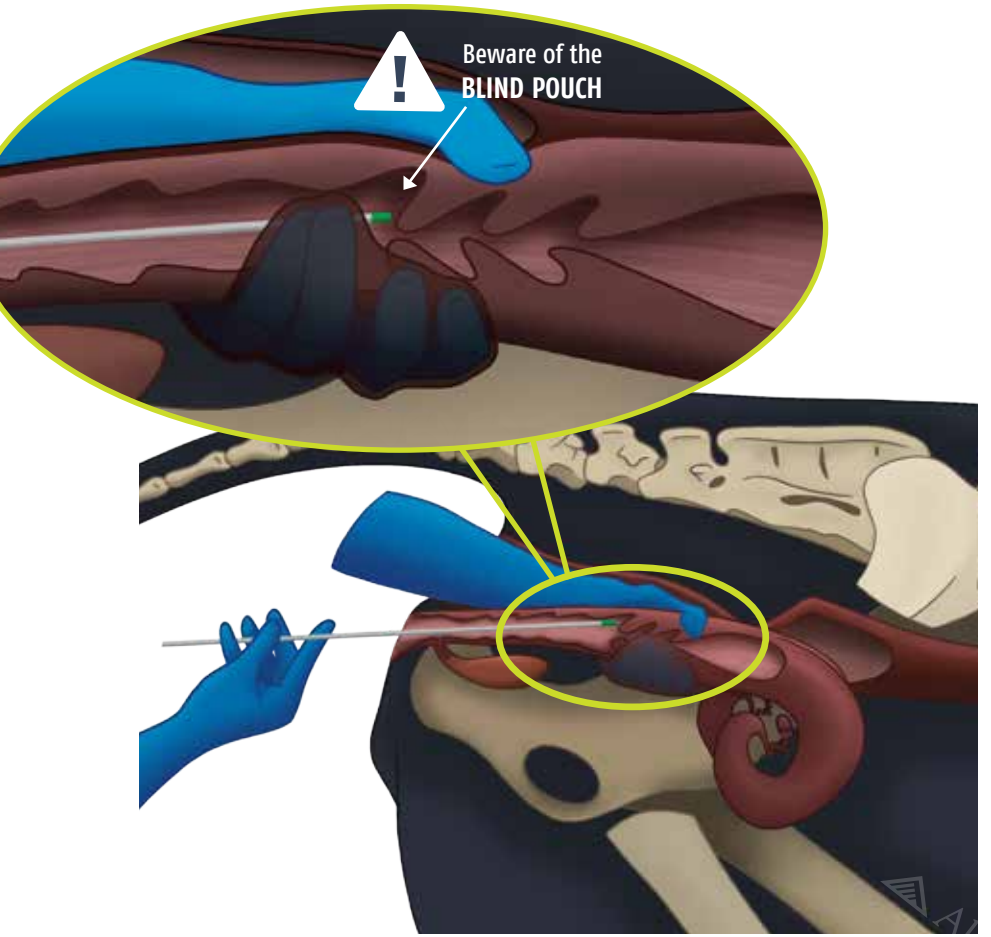


INSEMINATION TECHNIQUE

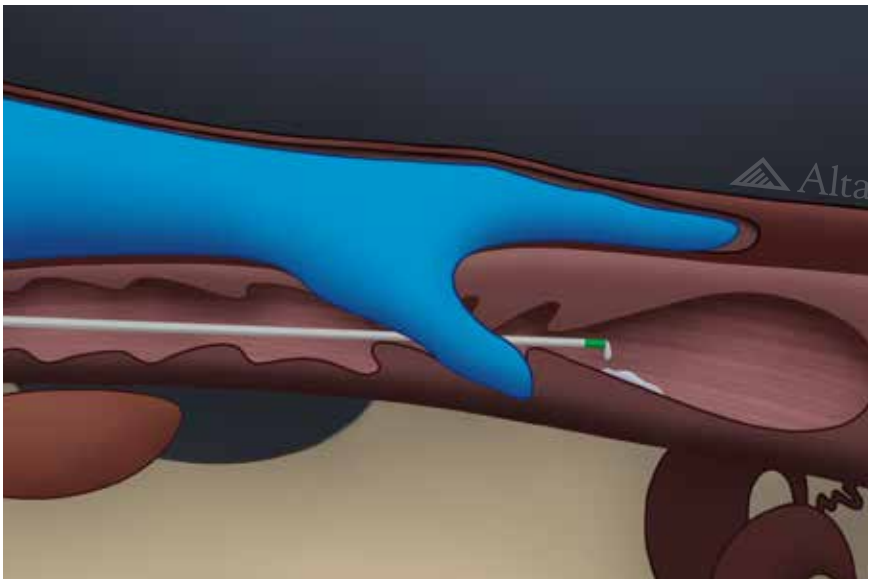
- Thoroughly wipe the vulva area with a clean paper towel to prevent reproductive tract contamination and infection
- Insert the insemination gun through the vulva at a 40–45 degree angle until it touches the roof of the vagina
- Level the insemination gun to go through the passageway to the cervix. This avoids the possibility of entering the urethra located on the floor of the vagina.

INSEMINATION TECHNIQUE

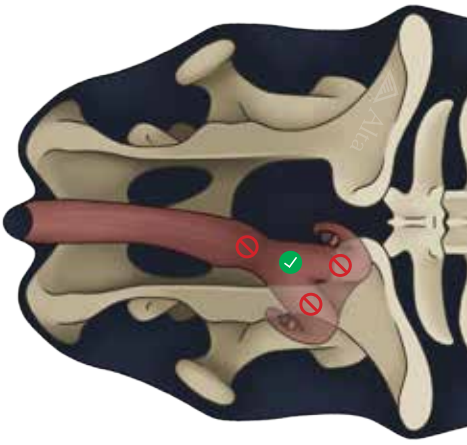
- While passing the AI gun through the vagina, push the cervix forward with your hand. This stretches the vagina, preventing the gun from getting caught in a vaginal fold or blind pouch around the cervix entrance.
- The gun tip can be guided to the cervical canal by the fingers of the hand holding the cervix.
- With the AI gun tip in the cervical canal, maintain slight forward pressure on the rod while manipulating the cervix ahead of the gun.



INSEMINATION TECHNIQUE



- While you pass the AI gun through the cervix, keep your index finger at the end of the cervical canal to feel the gun tip at the target site, the uterine body
- Lift finger and slowly deposit the semen in the uterine body. This location maximizes the amount and equal distribution of semen on the uterine body.
- Make sure you are on the target at all times.
- You decrease your chance at creating a pregnancy and may cause damage to the uterus if...
  - you fall short and deposit semen in the cervix
  - you go too far and deposit it in the uterine horns



INSEMINATION TECHNIQUE

- After all semen is deposited, withdraw the AI gun and your arm, release the sheath and the straw from the AI gun.
- Peel your glove hand over the sheath and straw and dispose them in a proper trash container.
- Clean your hands.
- Complete the breeding record immediately after each insemination.

Clean equipment daily with a paper towel wet with alcohol.

Clean your footwear before leaving the AI area.

REPRODUCTIVE KEY PERFORMANCE INDICATORS

TOP 3 REPRO KPIs

Pregnancy Rate

The proportion of eligible cows that become pregnant each 21-day cycle

Target: >23%

- Preg Rate is most accurately calculated in DairyComp
- You can estimate Preg Rate by multiplying Service Rate x Conception Rate

Service Rate

The percent of eligible cows that were inseminated in a 21-day period

Target: >65%

- Service Rate appears on the same DairyComp graph as Preg Rate
- Also called Heat Detection Rate
- To calculate, if there are 100 eligible cows, and 65 of them are inseminated in a given 21-day period, the service rate equals 65%

Conception Rate

The percent of inseminations that result in a pregnancy

Target: >35%

- CR is not calculated based on a 21-day period
- To calculate, if 100 animals are inseminated, and 35 of those animals become pregnant from that service, then the Conception Rate is 35%
- Many factors can affect Conception Rate:
  - Lactation Number
  - Service Number
  - Season or Month
  - Technician
  - Semen type (sexed or conventional)
  - Breeding code (standing heat, timed AI, etc.)

REPRO KPIs

What is an Eligible Cow?

- Past the Voluntary Wait Period (VWP)
- Not pregnant
- Not coded as a Do Not Breed (DNB) for more than half the cycle
- Not in the bullpen for more than half the cycle
- Present and eligible at least 11 days in the 21-day interval

ADDITIONAL REPRO KPIs

Palpated Pregnancy Rate (PPR)

- An indirect measure of estrus detection efficiency
- Calculated by dividing the number of cows found pregnant during preg check by the number of cows examinedExample: If 50 cows are checked for pregnancy, and 25 of those animals are confirmed pregnant, then:
  25 PG / 50 checked for PG = PPR of 25/50 or 50%
- **Target = >65%**

Extremely aggressive breeding decisions may lead to a high PPR but a lower Conception Rate (CR) because of a decline in estrus detection accuracyservicing animals that are not truly in estrus.

Be aware that this does not factor in the timeliness in which these pregnancies are created. We know a pregnancy that happens at 50 days is much more valuable than one created at 150 days.

Hard Count Pregnancy Creation

- Percent of the adult milking herd that becomes pregnant in a given time period
- Since the number of eligible cows will vary per time period, this KPI should be looked at over a reasonable period of time.
- **Target = >8% per month**

10% of the milking herd made pregnant per month is an admirable goal. Few herds achieve this number; many achieve 9% pregnant per month. 10% per month is the same as 2.3% per week, 9% per month is the same as 2.1% per week.


THE RESULT
FRESH
BRED
DRY
PREG
EVENT
COW

NOTES

NOTES

NOTES

Alta Genetics Inc.
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Alta