# Artificial Insemination Training Program

Accelerated Genetics®

# HISTORY

- First AI research reports 200 years ago.
- A long ago, Arabs obtained semen from mated mares belonging to rival groups during night hours to inseminate their own mares.

# HISTORY

- In 1930, Russians had the technology for massive application of AI in agriculture.
- By late 30's AI reaches the US. AG is born in 1941.
- During early 50's, the modern freezing and thawing technique, which revolutionized and spread out the usage of AI across the world was developed in England.

# ARTIFICIAL INSEMINATION IN DAIRY CATTLE

- The main reasons for using AI.
- It is:
  - Easy
  - Inexpensive
  - Successful
- Over 75 years of massive use

# ADVANTAGES

- Allows to use the best proven bulls (genetic improvement)
- Mating programs
- Less reproductive health risks
- Helps Identify reproductive problems
- Facilitates the implementation of synchronization programs
- Eliminates the danger of manipulating bulls

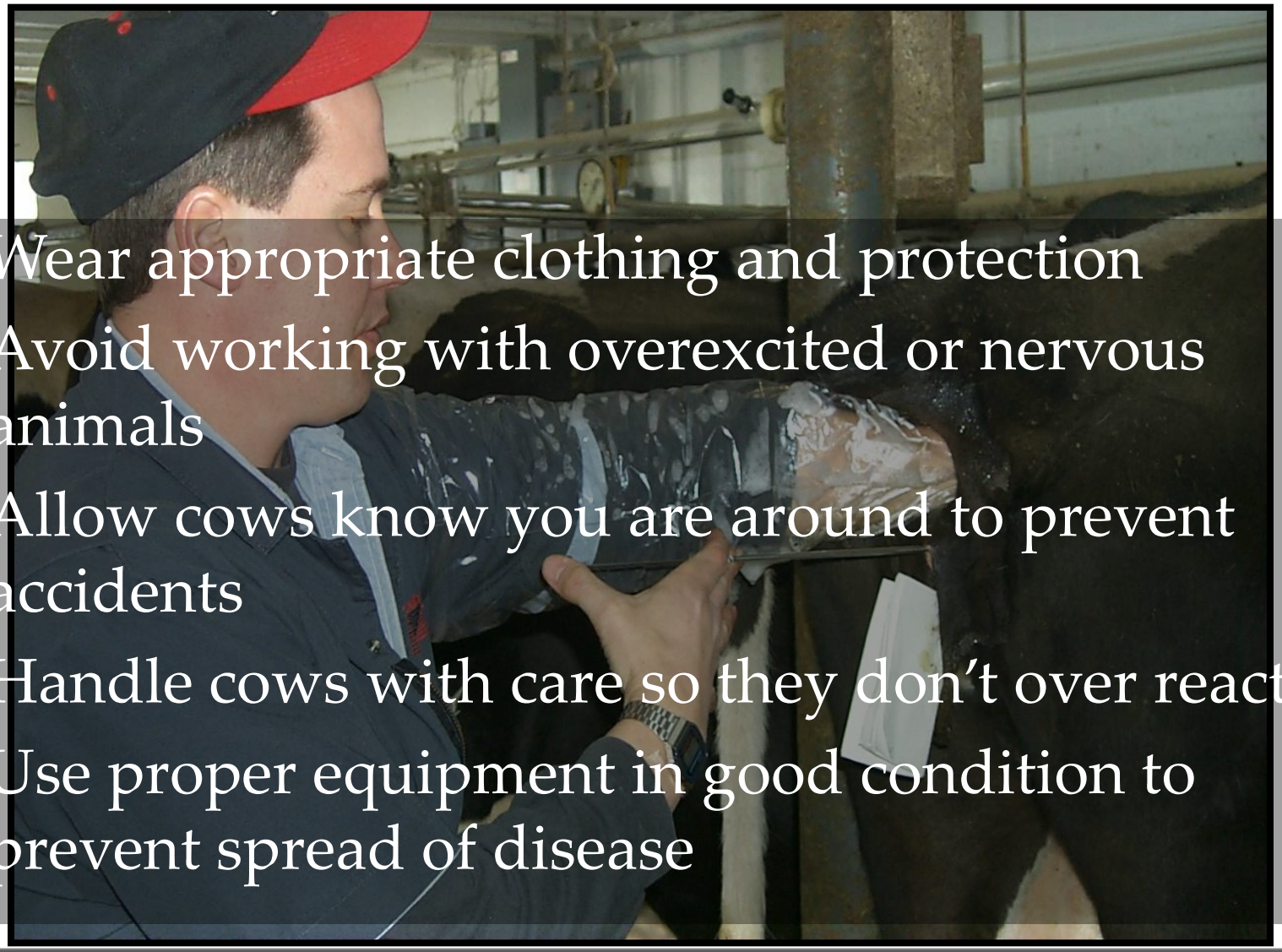
# REQUIREMENTS

- Healthy and well fed animals
- Trained personnel
- Heat detection
- Individual records
- Facilities
- Equipment
- Success or failure depends on the program manager

# SAFETY AND WELLBEING

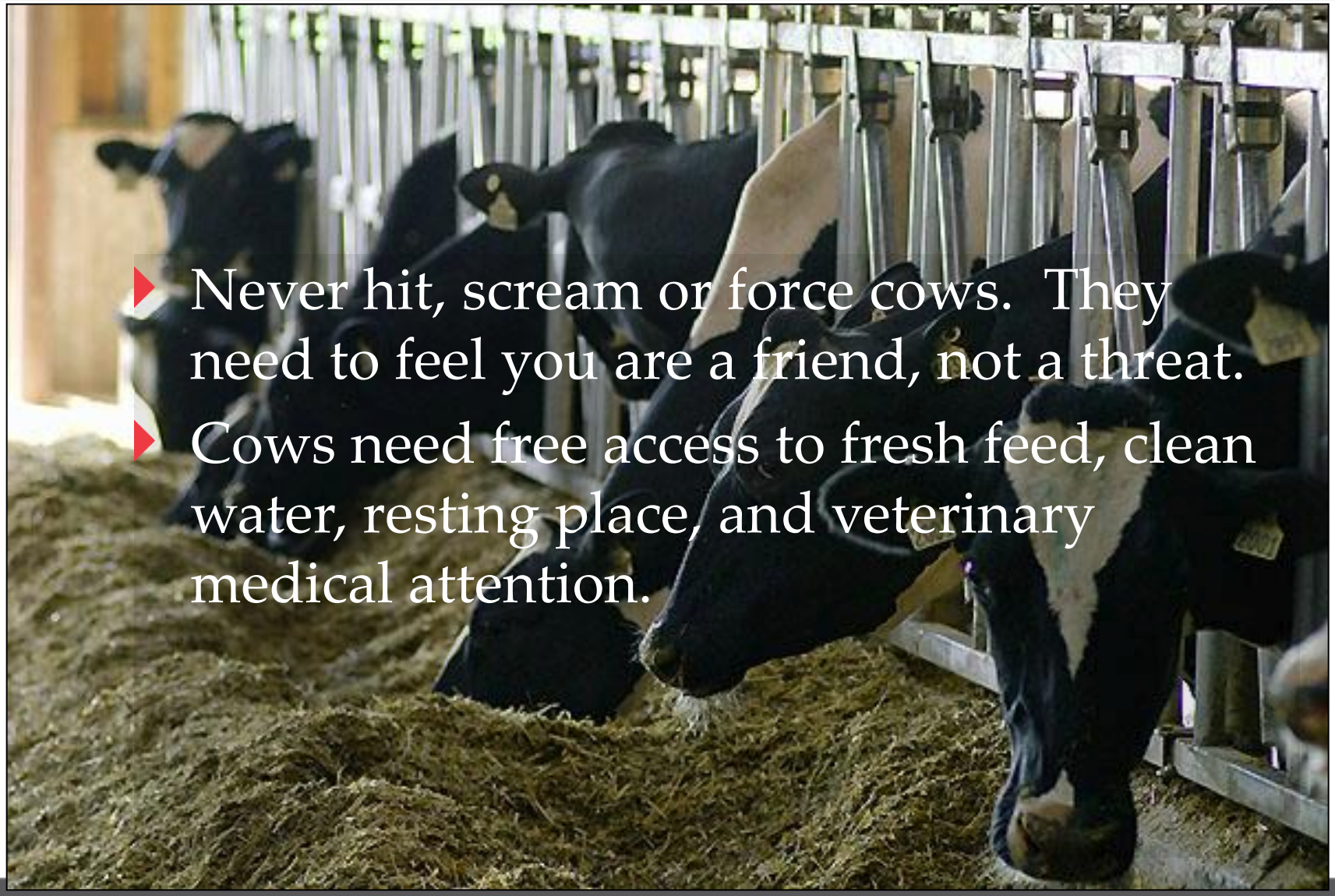
Protect your self and take good care of cows

# YOUR SAFETY AND WELLBEING



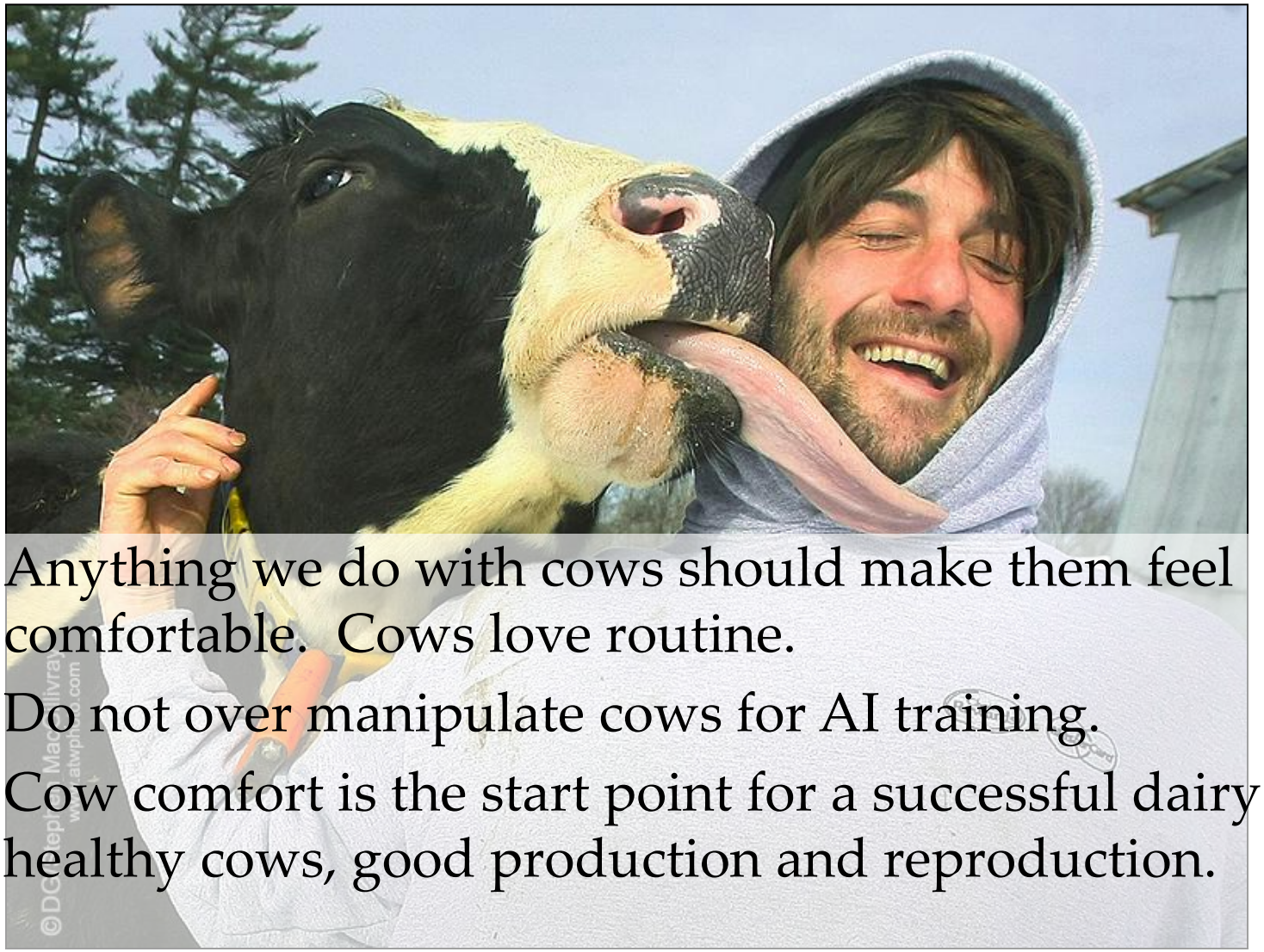
- Wear appropriate clothing and protection
- Avoid working with overexcited or nervous animals
- Allow cows know you are around to prevent accidents
- Handle cows with care so they don't over react
- Use proper equipment in good condition to prevent spread of disease

# COW SAFETY AND WELLBEING



- Never hit, scream or force cows. They need to feel you are a friend, not a threat.
- Cows need free access to fresh feed, clean water, resting place, and veterinary medical attention.

# COW SAFETY AND WELLBEING



- Anything we do with cows should make them feel comfortable.  Cows love routine.
- Do not over manipulate cows for AI training.
- Cow comfort is the start point for a successful dairy: healthy cows, good production and reproduction.

# OUTLINE

1. **Reproductive Anatomy of the Cow**
2. **Reproductive Physiology of the Cow**
3. **Semen Processing**
4. Artificial Insemination Technique
5. AI Equipment and its Care
6. Preparing AI Equipment for Breeding
7. Inseminating the Cow
8. Records

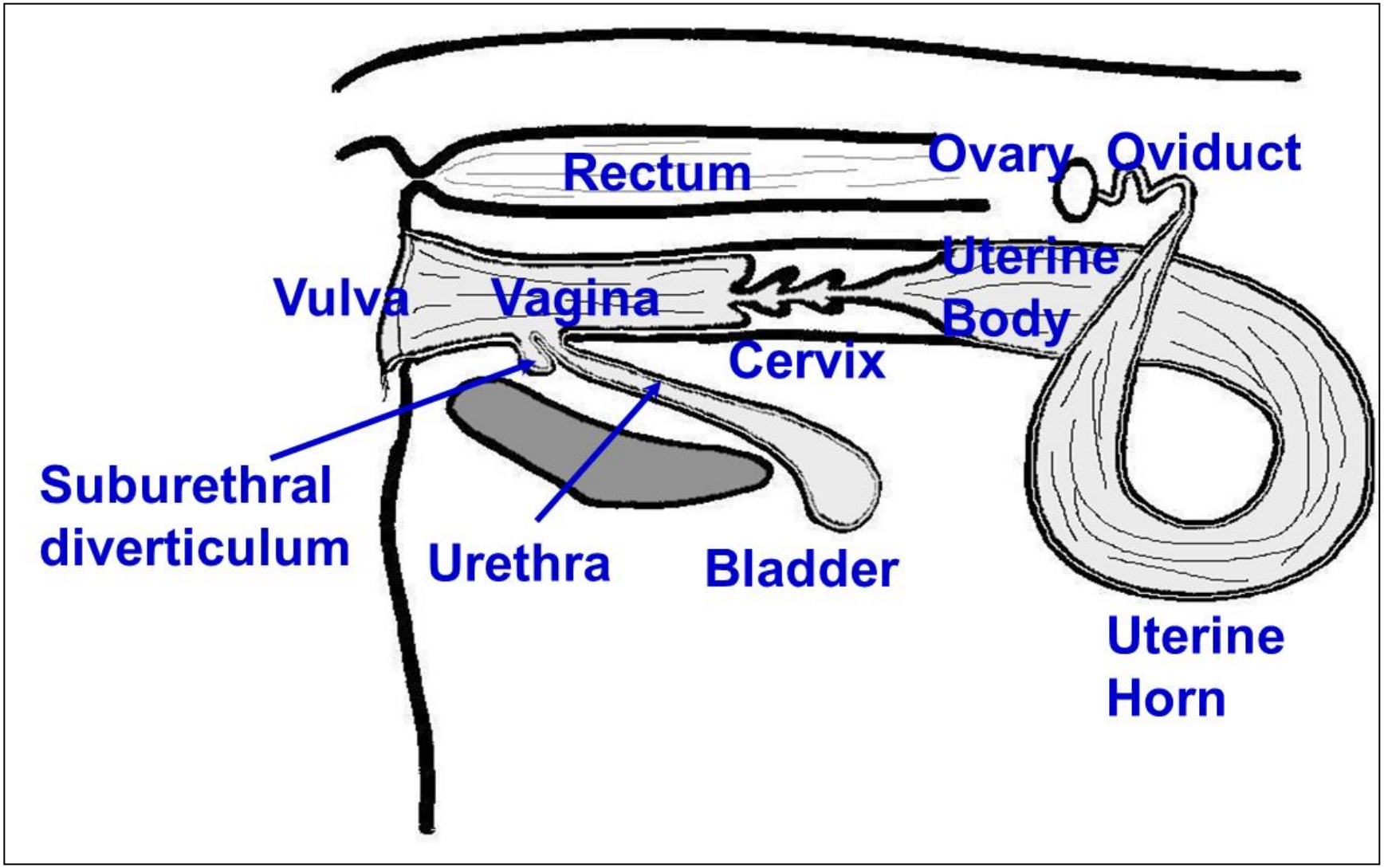
# IN SUMMARY, AI IS:

- Cleanliness
- Consistency (Technique)
- Recordkeeping

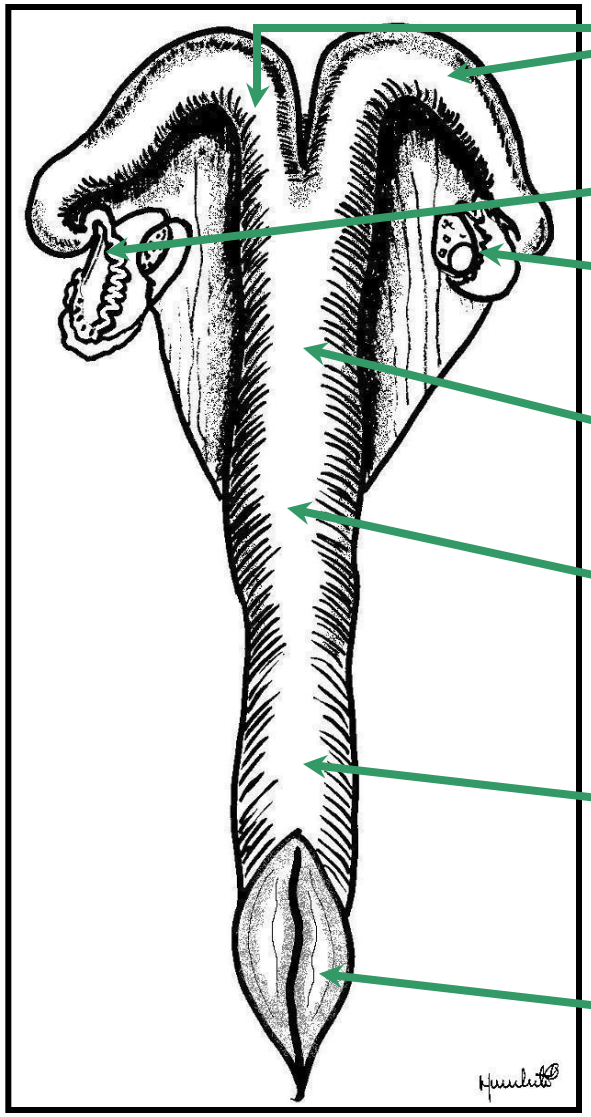
# REPRODUCTIVE ANATOMY
# CHAPTER 1

ARTIFICIAL INSEMINATION
TRAINING PROGRAM

# LEARN THE ANATOMY



# COW REPRODUCTIVE TRACT



Uterine Horns

Oviduct

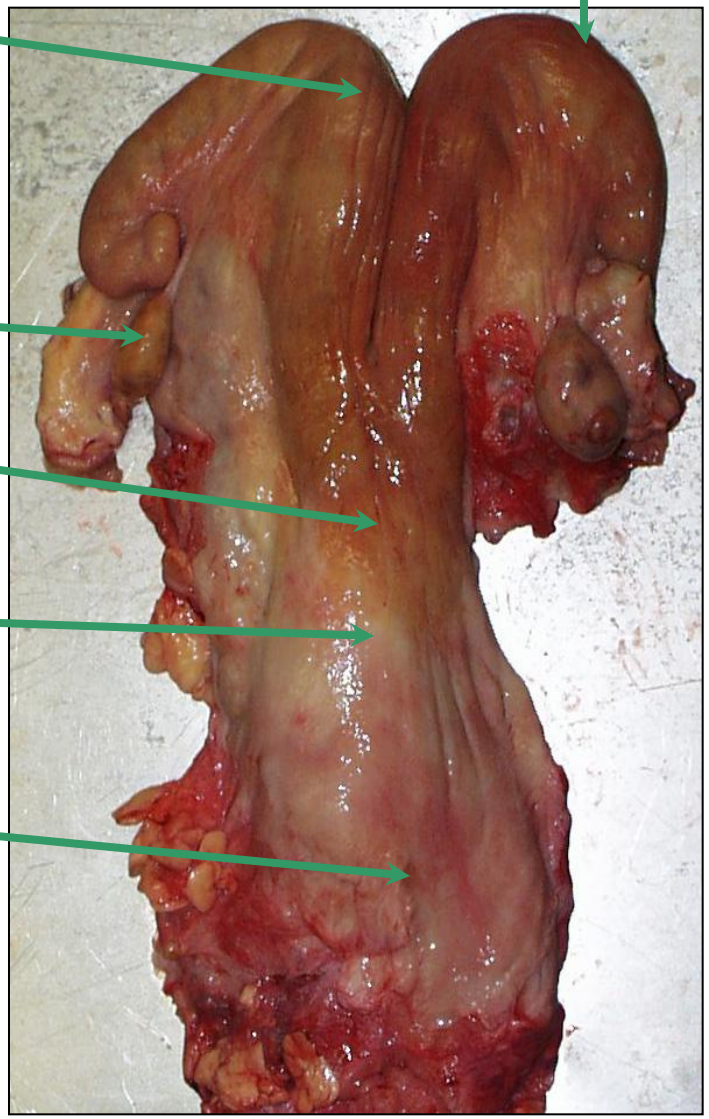
Ovary

Uterine Body

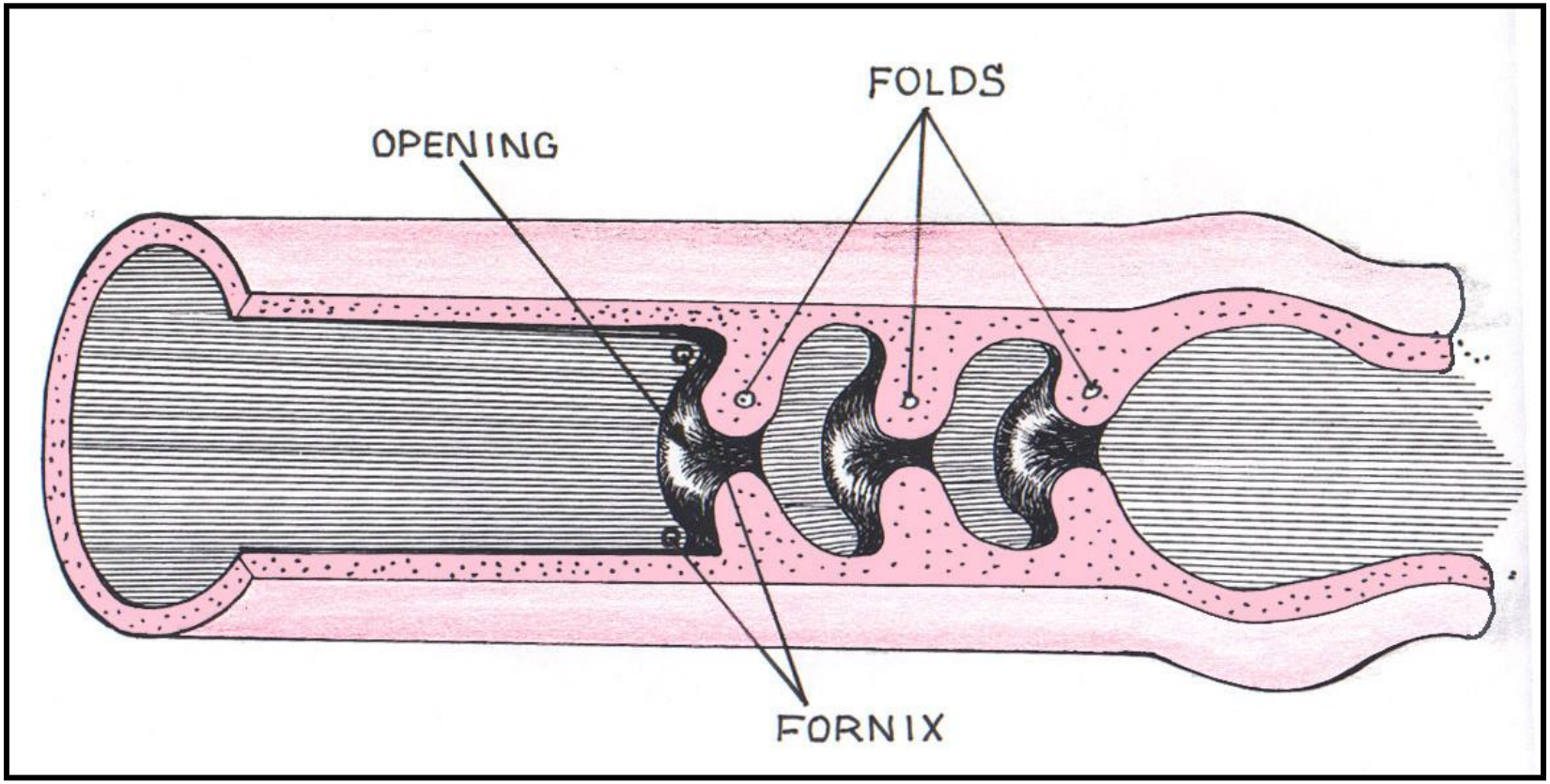
Cervix

Vagina

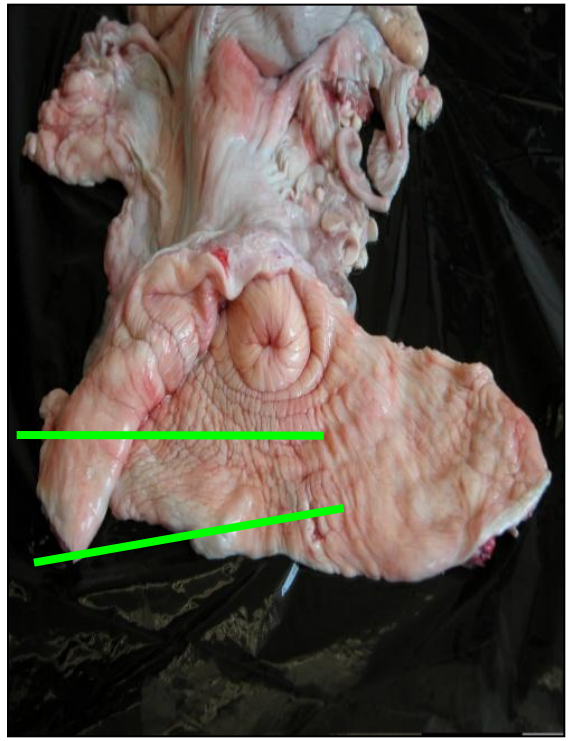
Vulva



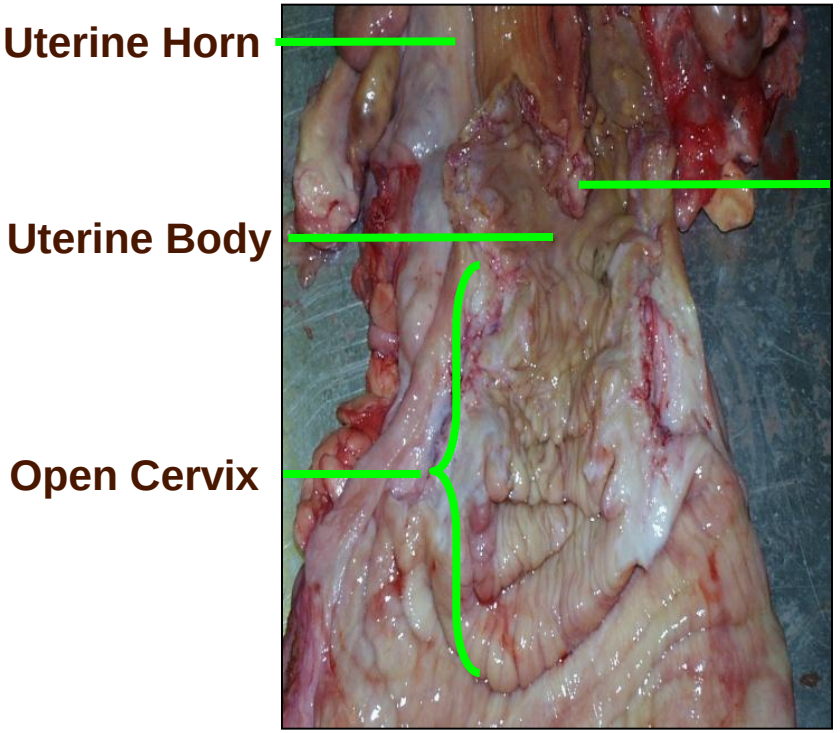
# ANATOMY OF THE CERVIX



# CERVIX DISSECTION

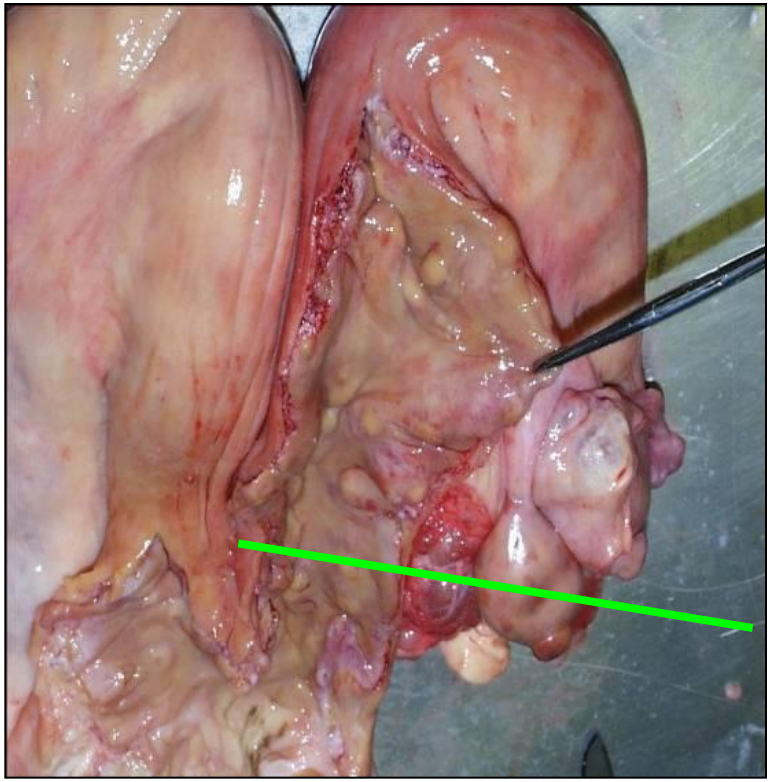



**Cervix (Open Vagina)**

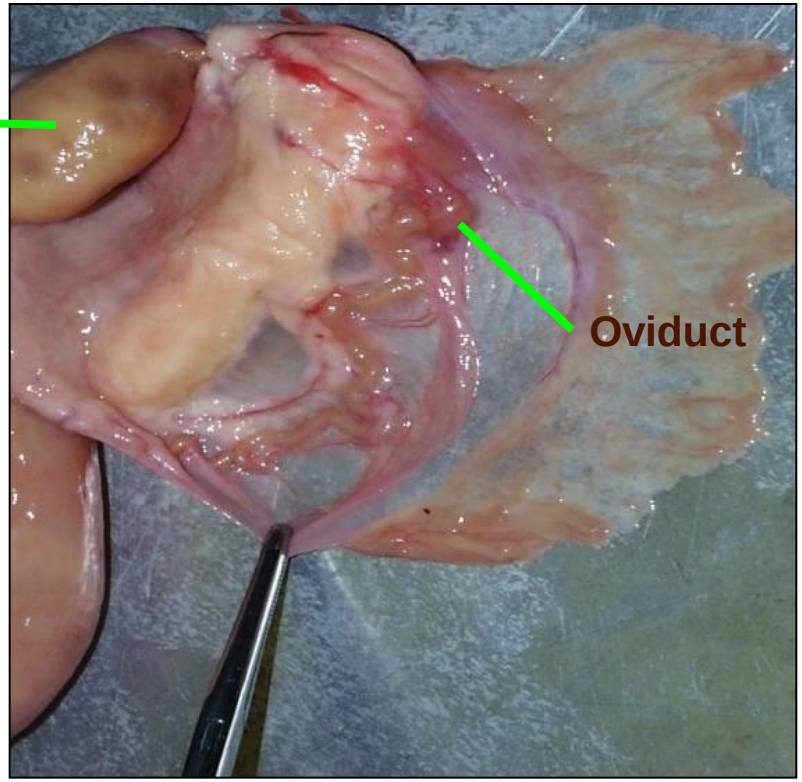



**Cervix (Open Vagina and Cervix)**

# UTERUS AND OVIDUCT

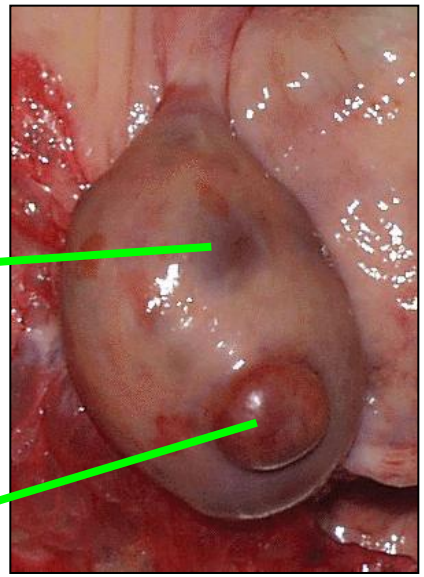



Right Horn Open

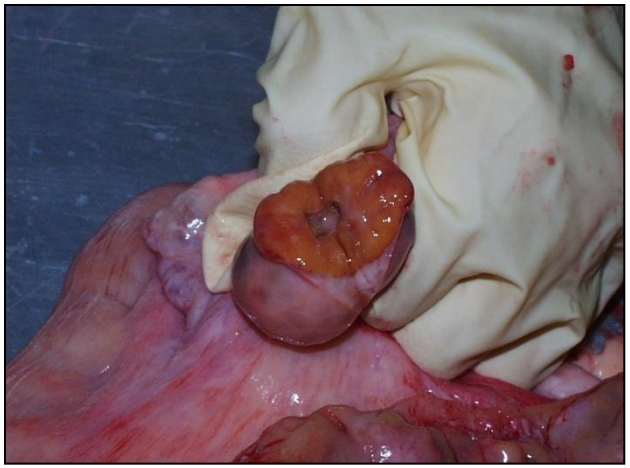



Oviduct

# OVARIES



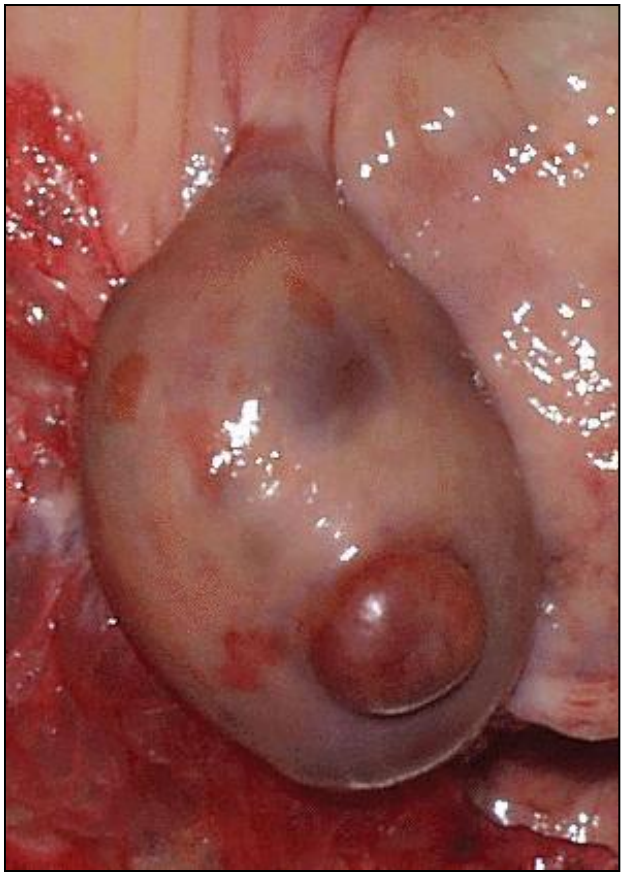

Follicle and Corpus Luteum



Corpus Luteum Open

Corpus Luteum with Cavity

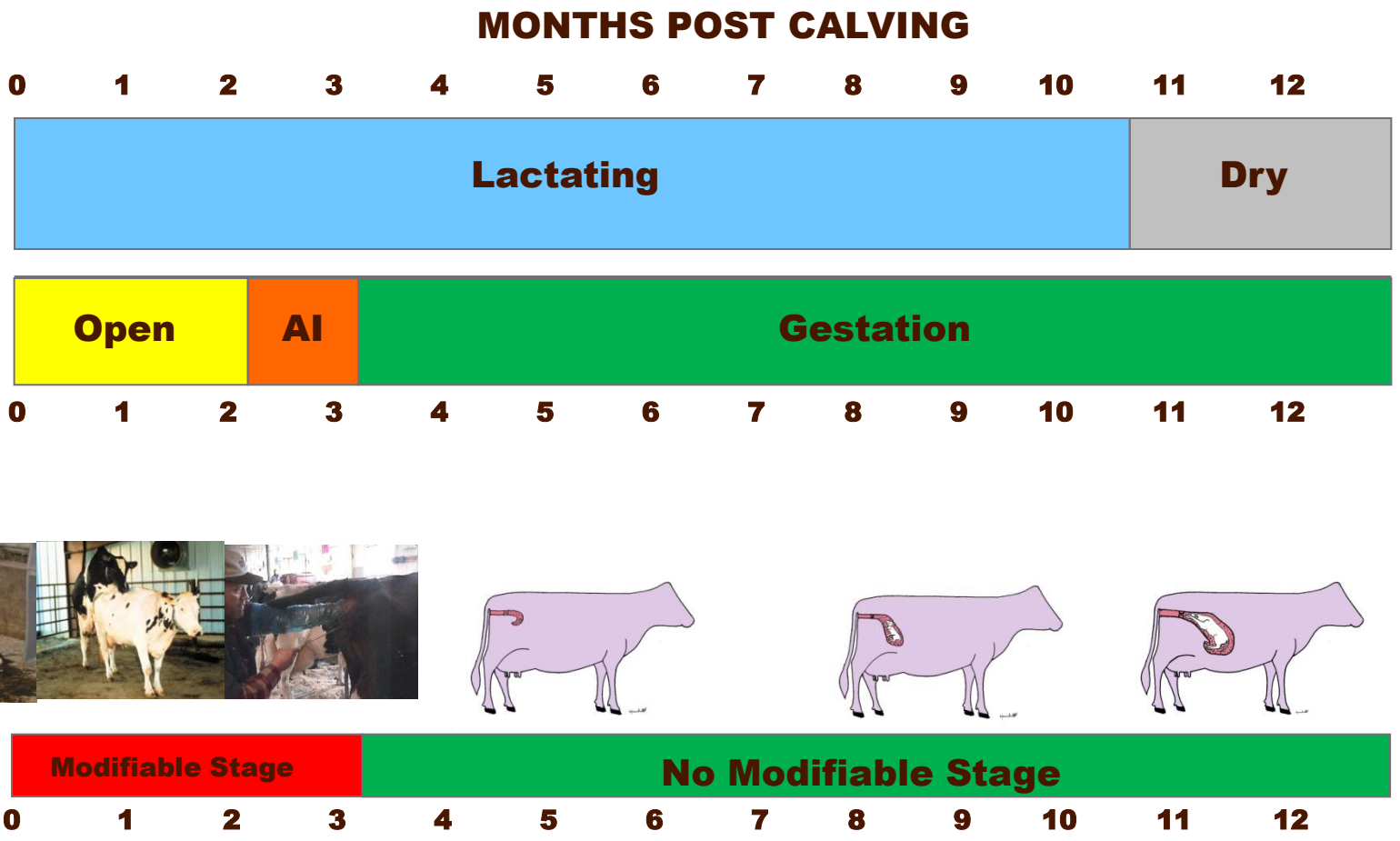
# OVARIAN STRUCTURES



# REPRODUCTIVE PHYSIOLOGY CHAPTER 2

ARTIFICIAL INSEMINATION TRAINING PROGRAM

# PRODUCTIVE CYCLE AND REPRODUCTIVE CYCLE



- In a 12-month Calving Interval, Both Cycles Combine as Follows:

| Productive Cycle | | Reproductive Cycle | |
|---|---|---|---|
| **Event** | **Duration** | **Event** | **Duration** |
| Lactation | 10 mo | Voluntary Waiting Period | 2 mo |
| Dry | 2 mo | First service to conception | 1 mo |
| | | Conception to calving (Gestation) | 9 mo |
| **Total** | **12 mo** | **Total** | **12 mo** |

# VOLUNTARY WAITING PERIOD

- It is a management decision
- Not recommended: <45 DIM
- Ideal: 55-60 DIM for heat detection AI
- Ideal: >65-70 DIM for TAI programs

# ANATOMICAL INVOLUTION


1 day

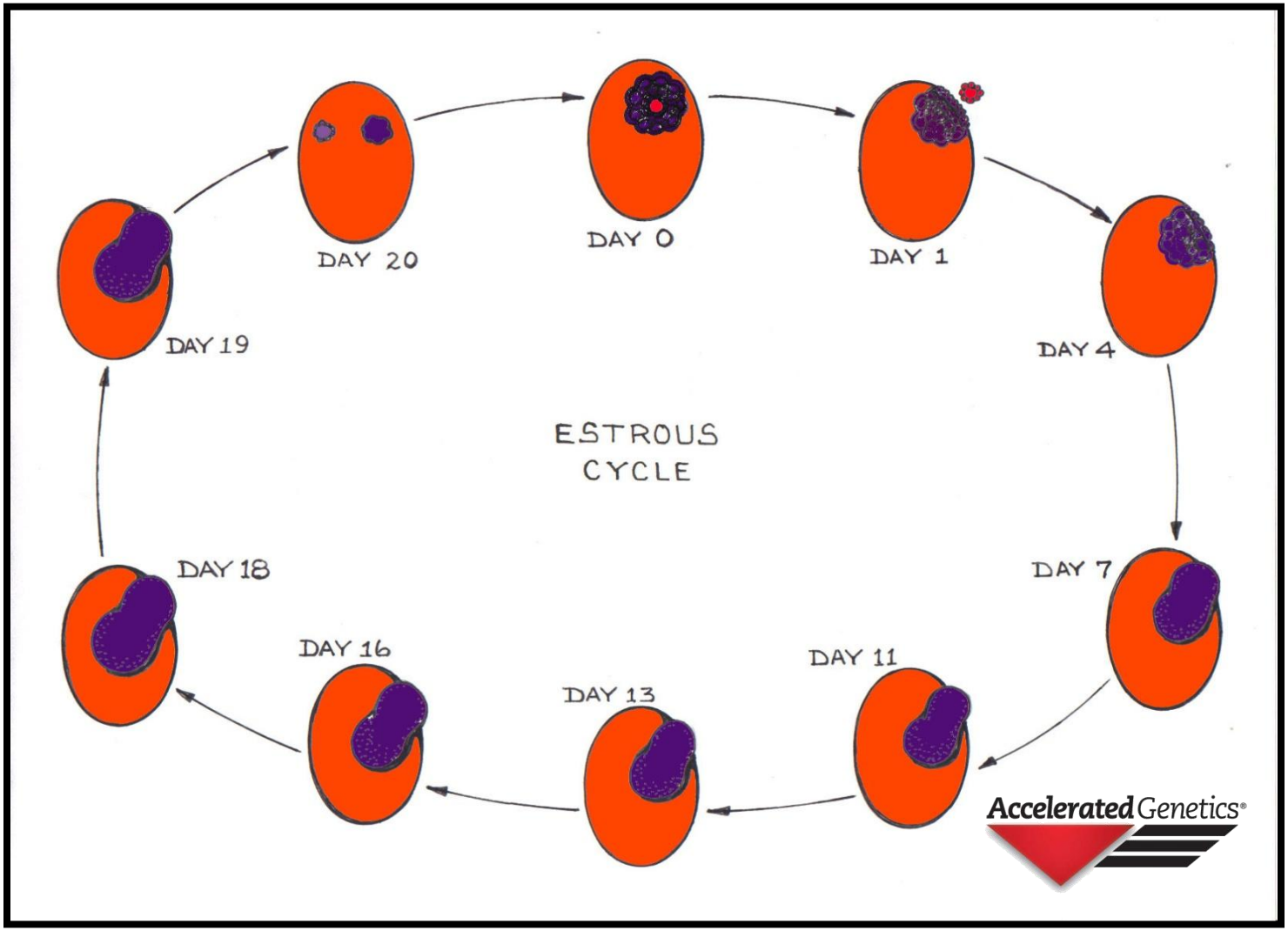

5 days


10days

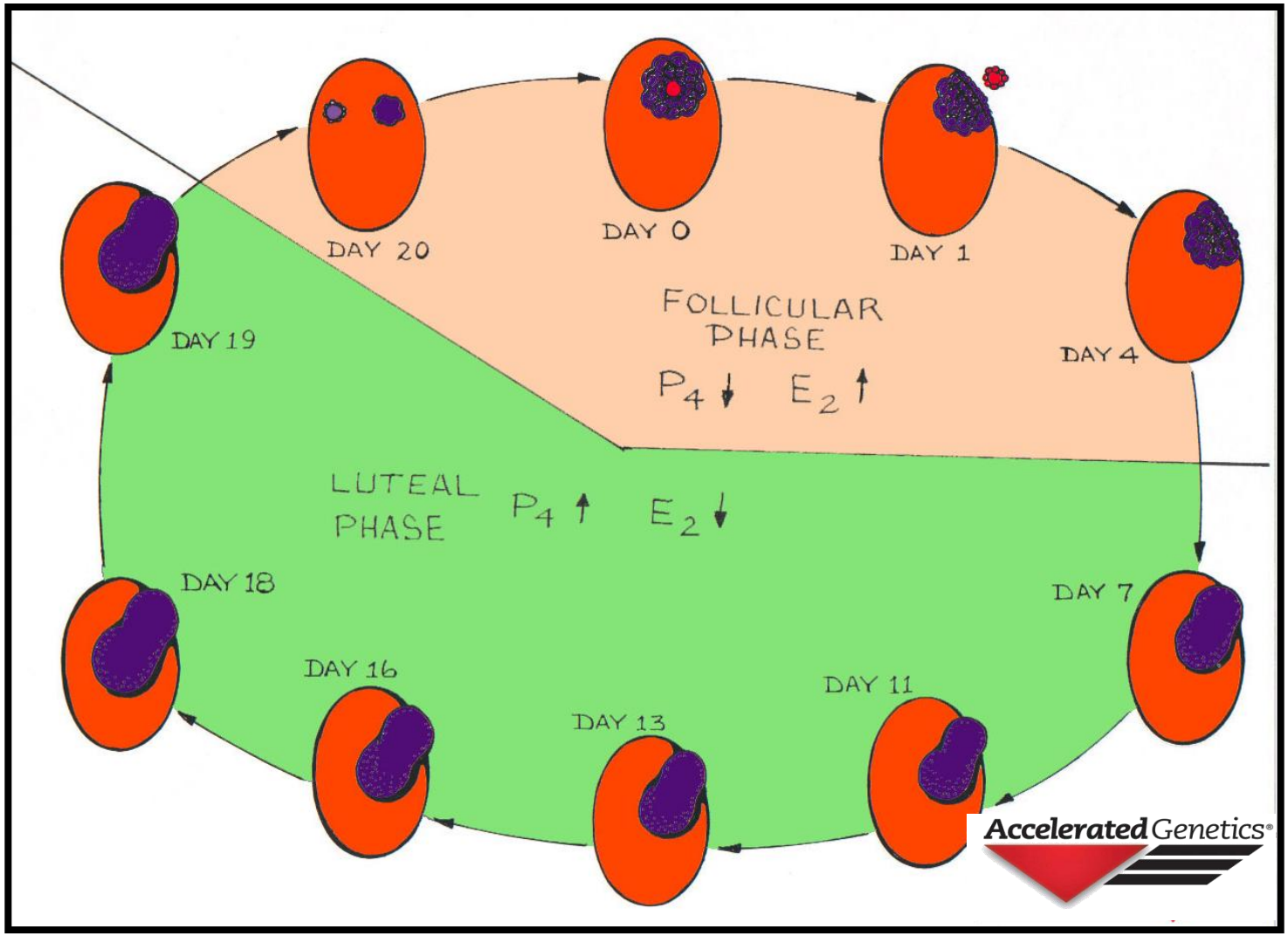

15 days


20 days

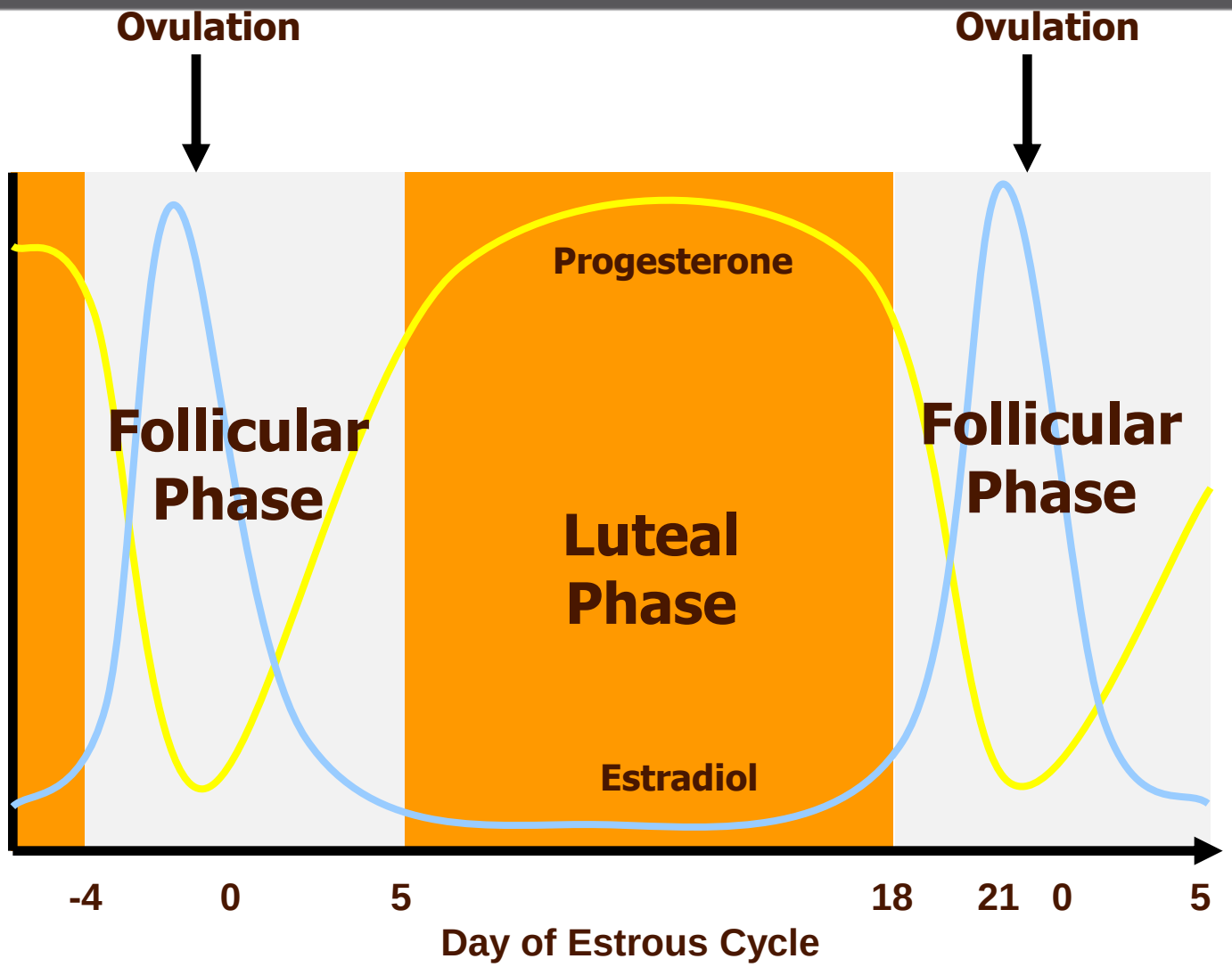
# ESTROUS CYCLE

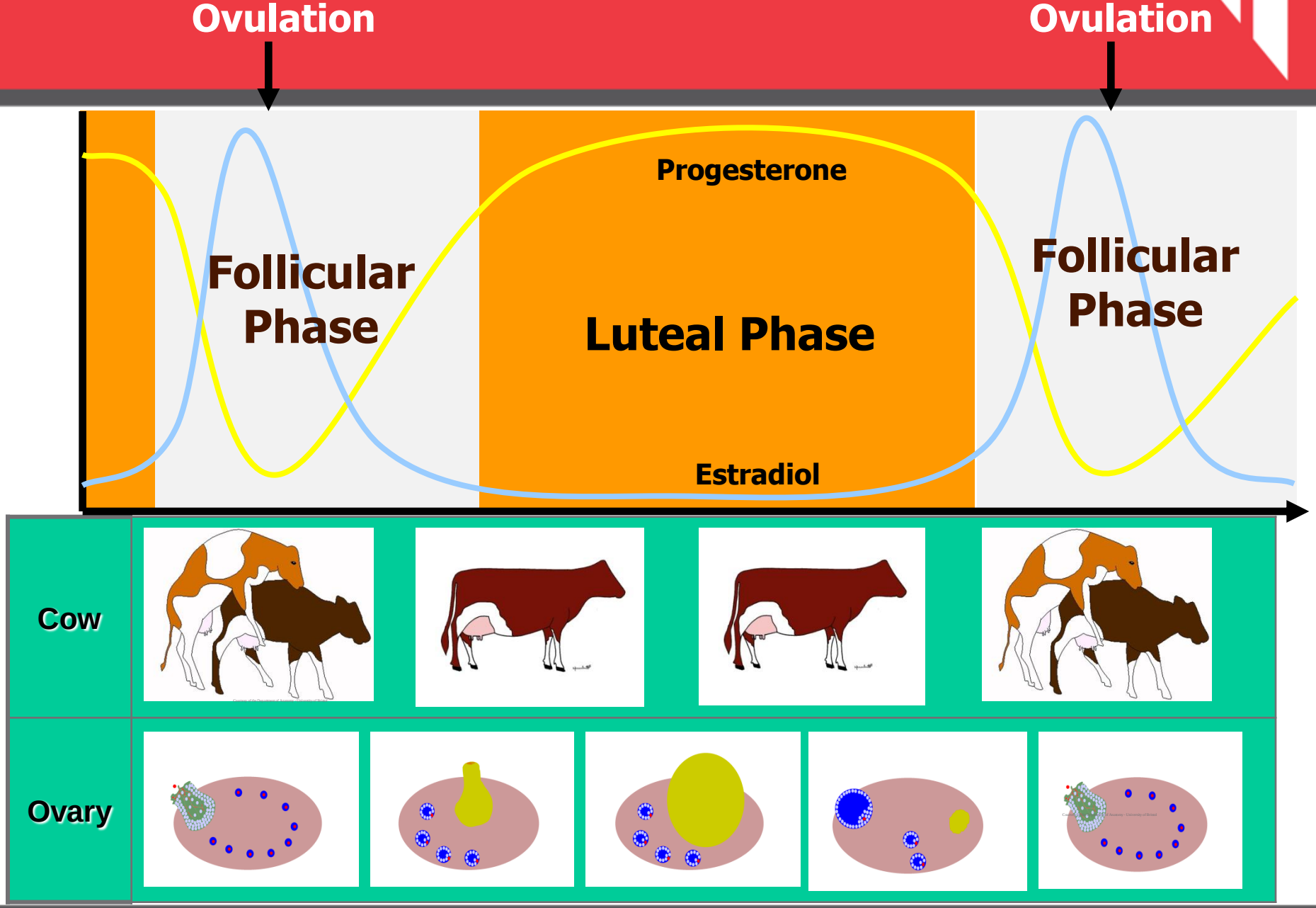


# LUTEAL/FOLLICULAR PHASE

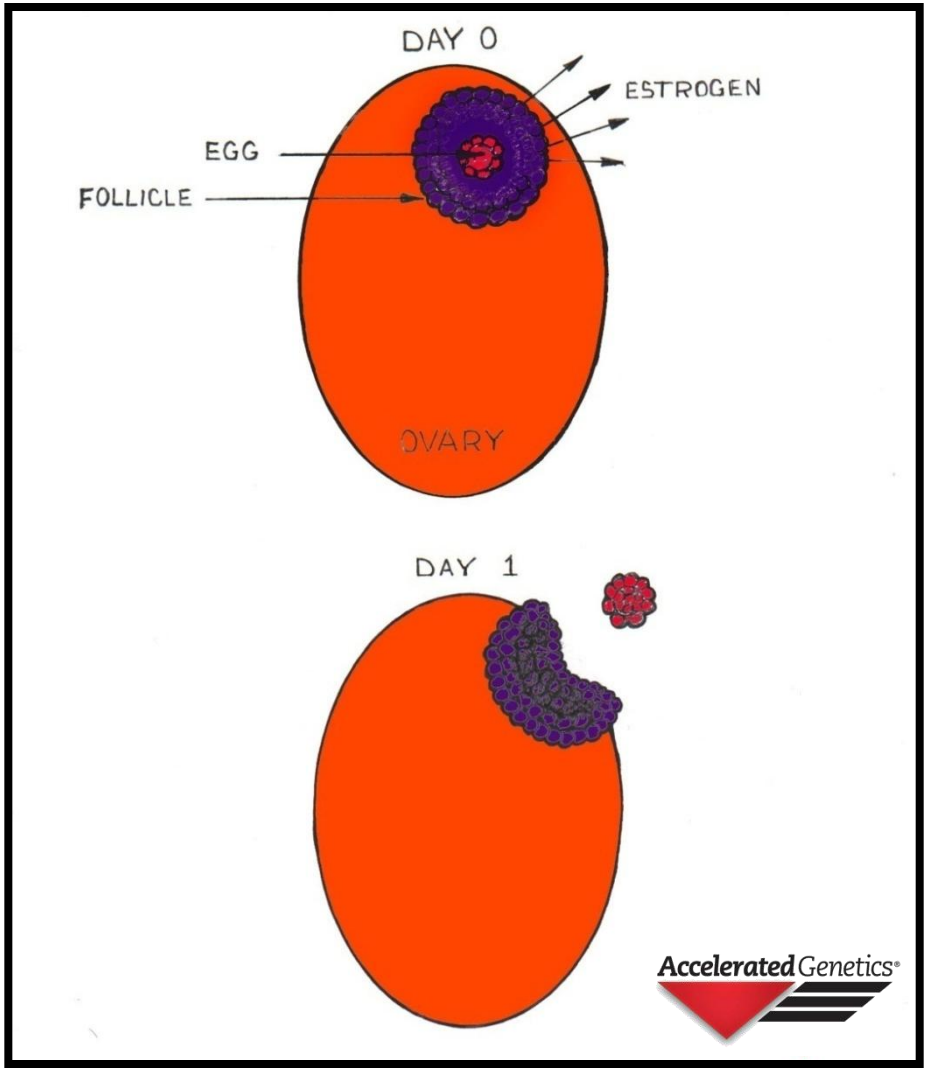


# ESTROUS CYCLE

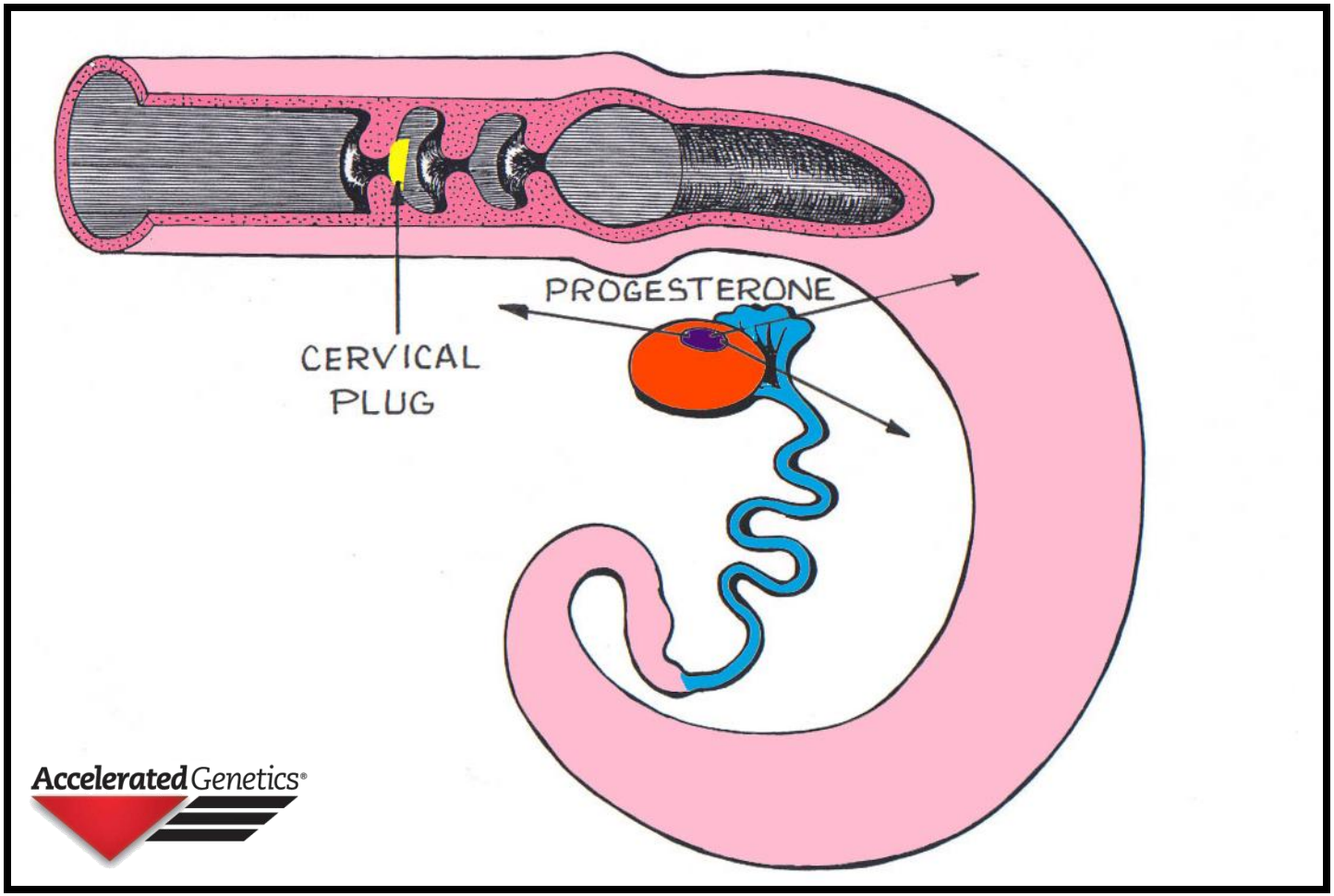



Ovulation
Ovulation
Follicular Phase
Progesterone
Luteal Phase
Estradiol
Follicular Phase
Cow
Ovary

# OVULATION


DAY 0
ESTROGEN
EGG
FOLLICLE
OVARY
DAY 1
Accelerated Genetics

# FERTILIZATION

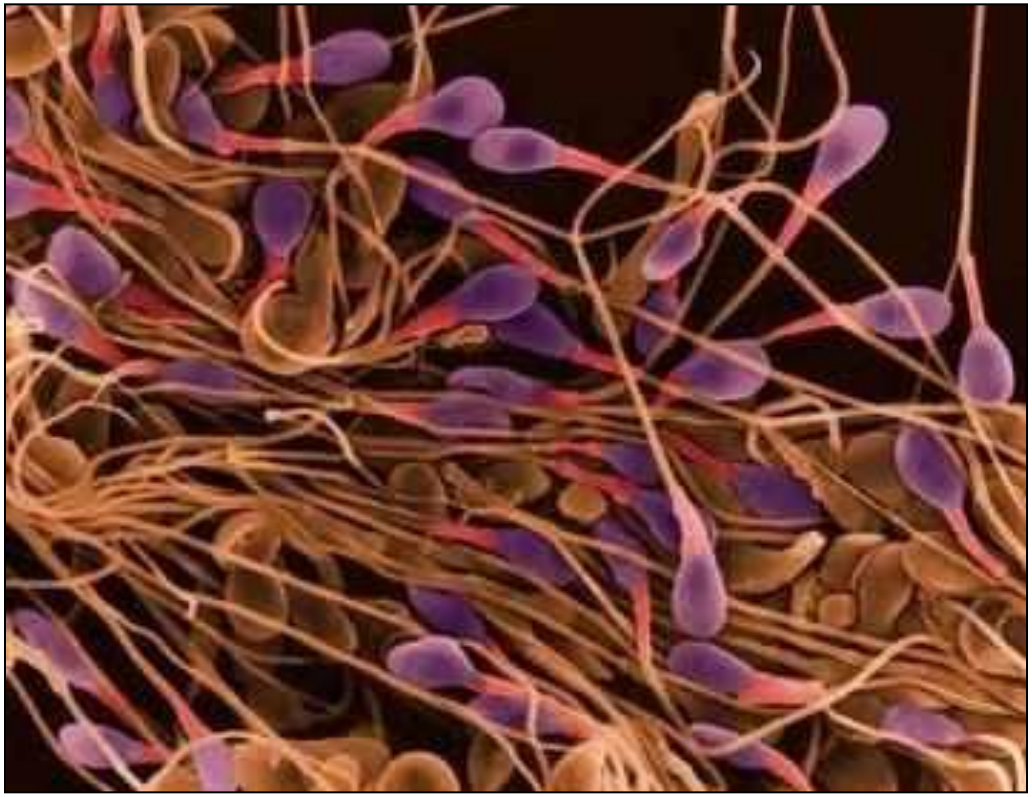


# SEMEN PROCESSING & HANDLING CHAPTER 3

ARTIFICIAL INSEMINATION TRAINING PROGRAM

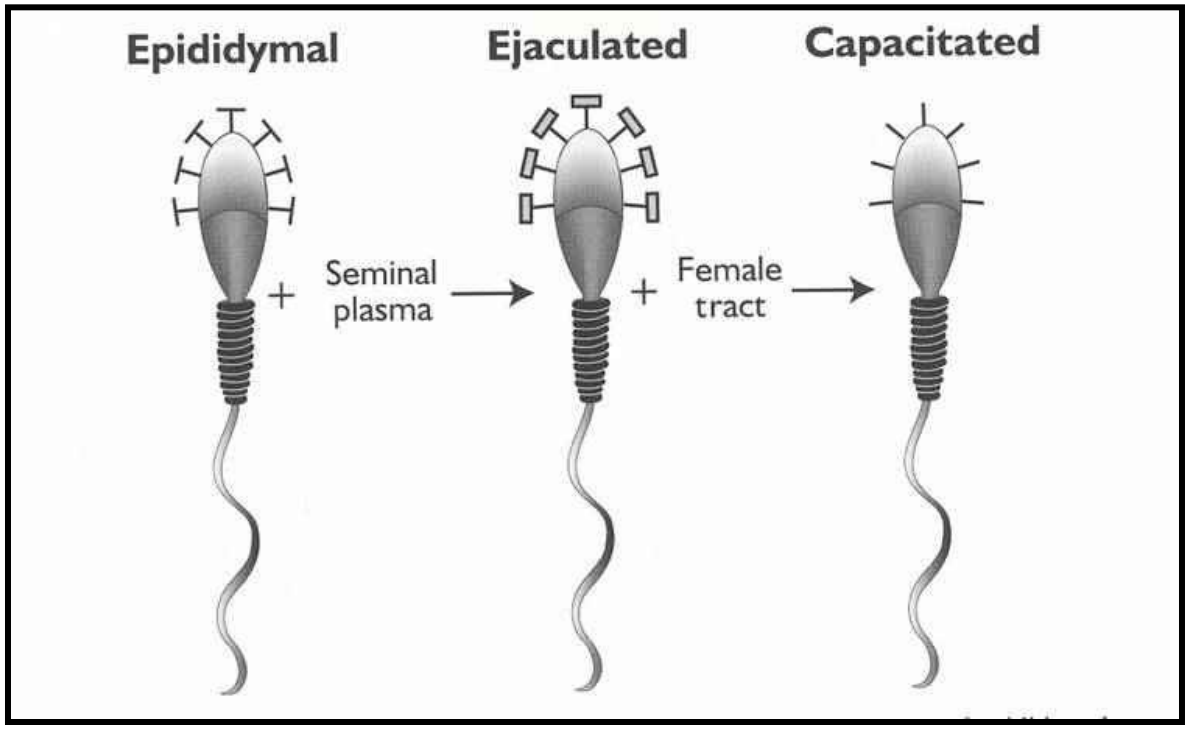
# NORMAL SPERM CELL

- A sperm cell has three parts
  - Head
  - Central piece
  - Tail



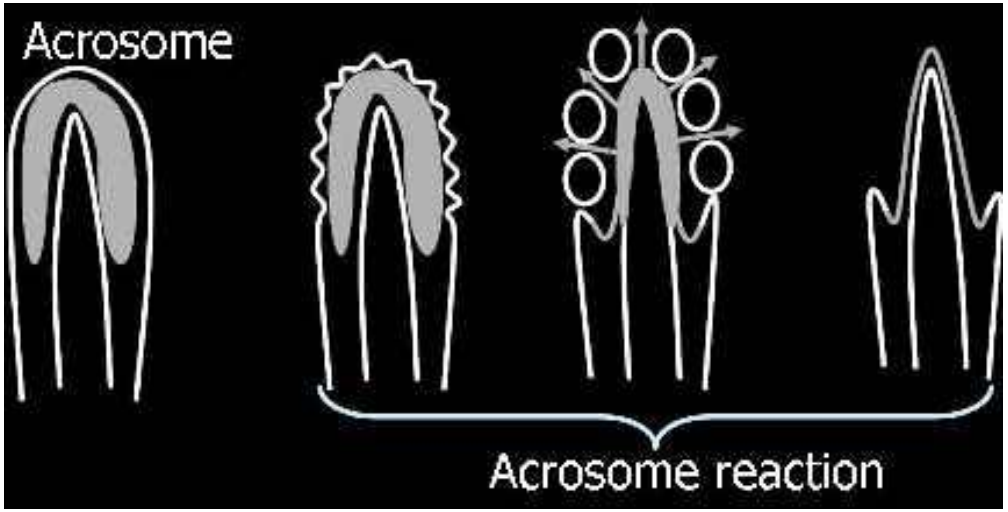
# CAPACITATION

- Sperms need to be around 6-8 hours in the cow's reproductive tract before they acquire fertilizing capacity



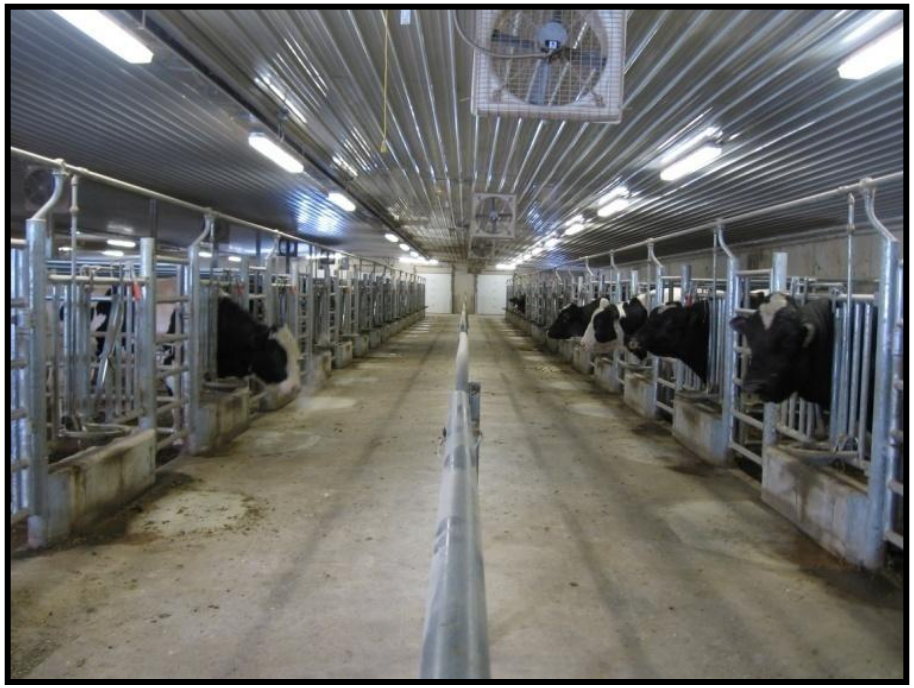
# ACROSOME REACTION

- Prior to fertilization, other chemical reactions must occur on the sperm head before entering the egg



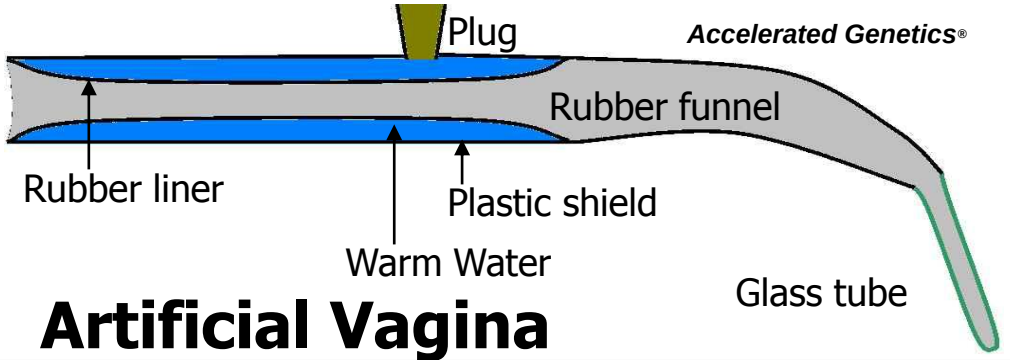

# SEMEN COLLECTION

- Bulls are safely housed and transported to the collection area

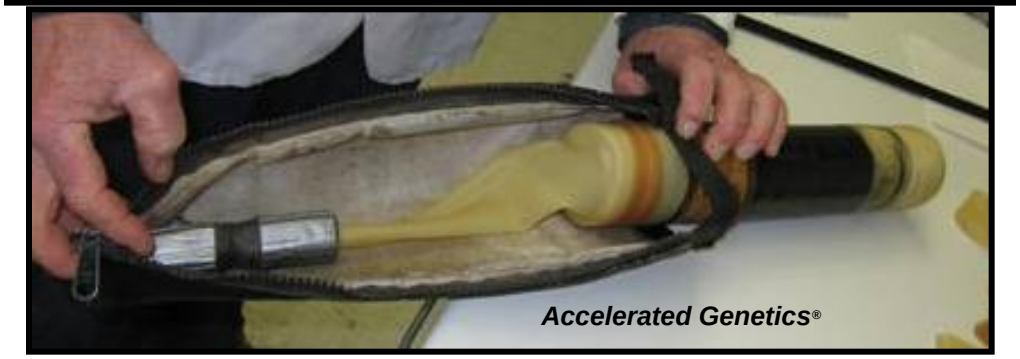


# SEMEN COLLECTION

- Semen is collected by Artificial Vagina




**Artificial Vagina**

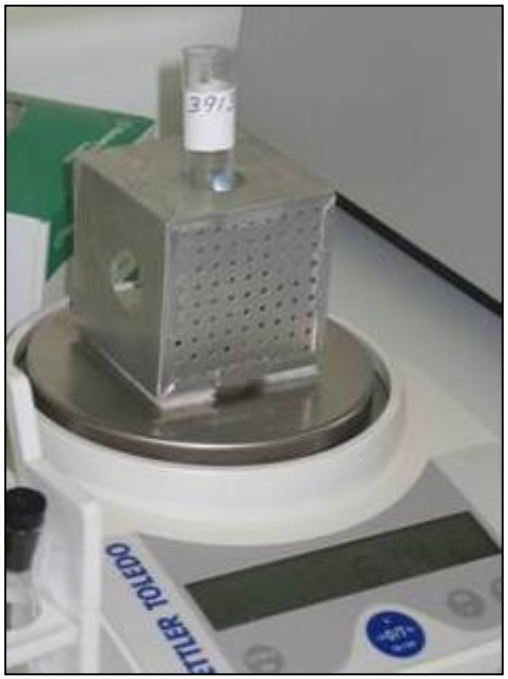




# SEMEN COLLECTION AND PROCESSING

- After collection, semen is:
- Evaluated Macroscopically
  - General appearance (color)
  - Volume
  - Density
- Evaluated Microscopically
  - Morphology
  - Motility

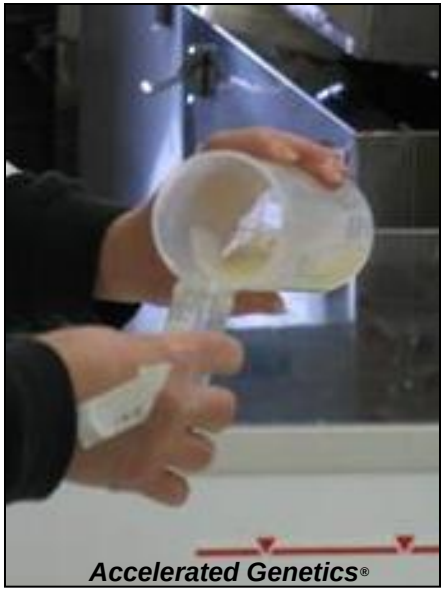
# SEMEN COLLECTION AND PROCESSING

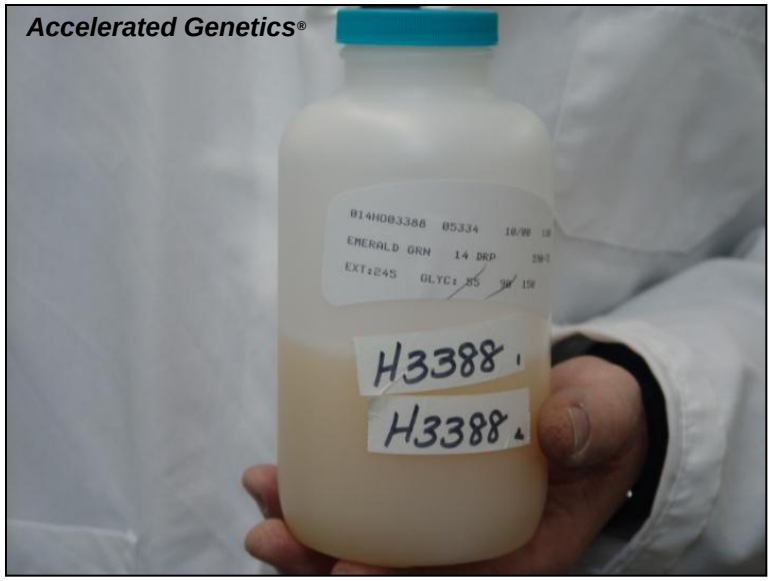
- Added antibiotics
- Weighted
- Incubated at 41° F (5°C) until processing



# SEMEN PROCESSING

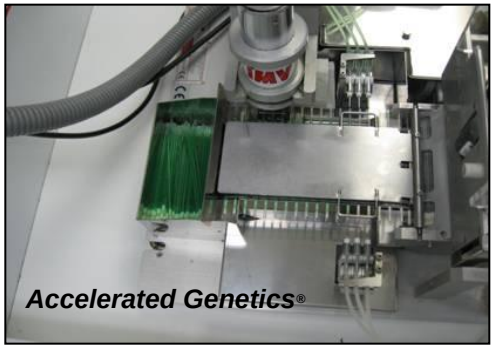
- Common Semen extenders in the industry:
  - Citrates, Glycerol, antibiotic, egg yolk and milk
- Accelerated Genetics uses a non animal extender (Biosecurity)

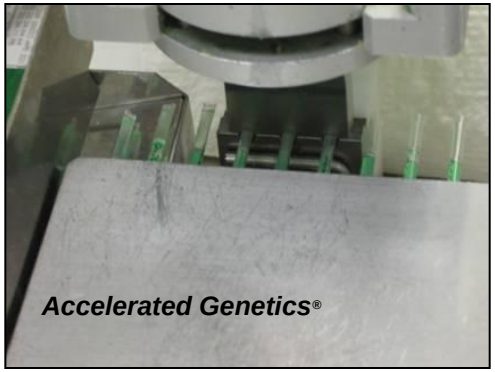


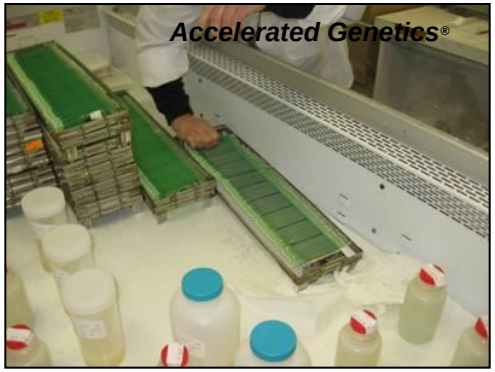



# SEMEN PACKING AND FREEZING

- Pre labeled straws are filled with semen using an electronic pump.
  - 0.50ml straw in the US.
  - 0.25ml straw in many other countries
- Straws are sealed by ultrasound
- Semen is placed on trays at 39° F (4℃)

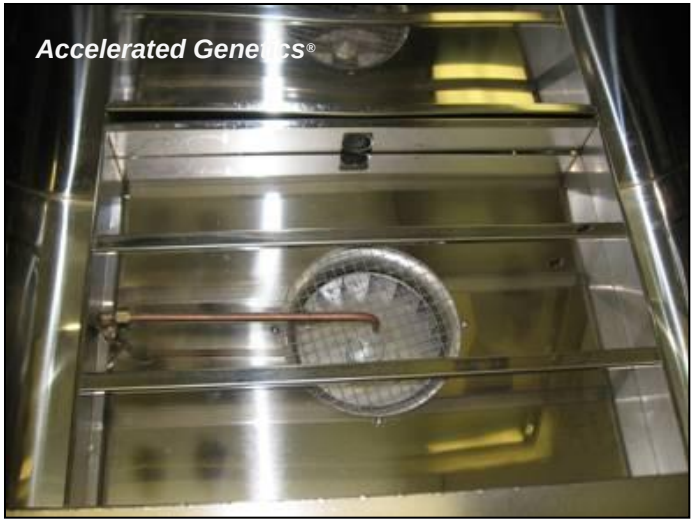


# SEMEN PACKING AND FREEZING

- Trays with semen straws are brought from 39℉ (4℃) to -184℉ (120℃) by Liquid Nitrogen vapors for a 10-minute period.
- Semen straws are placed in LN at -320℉ (-196℃)

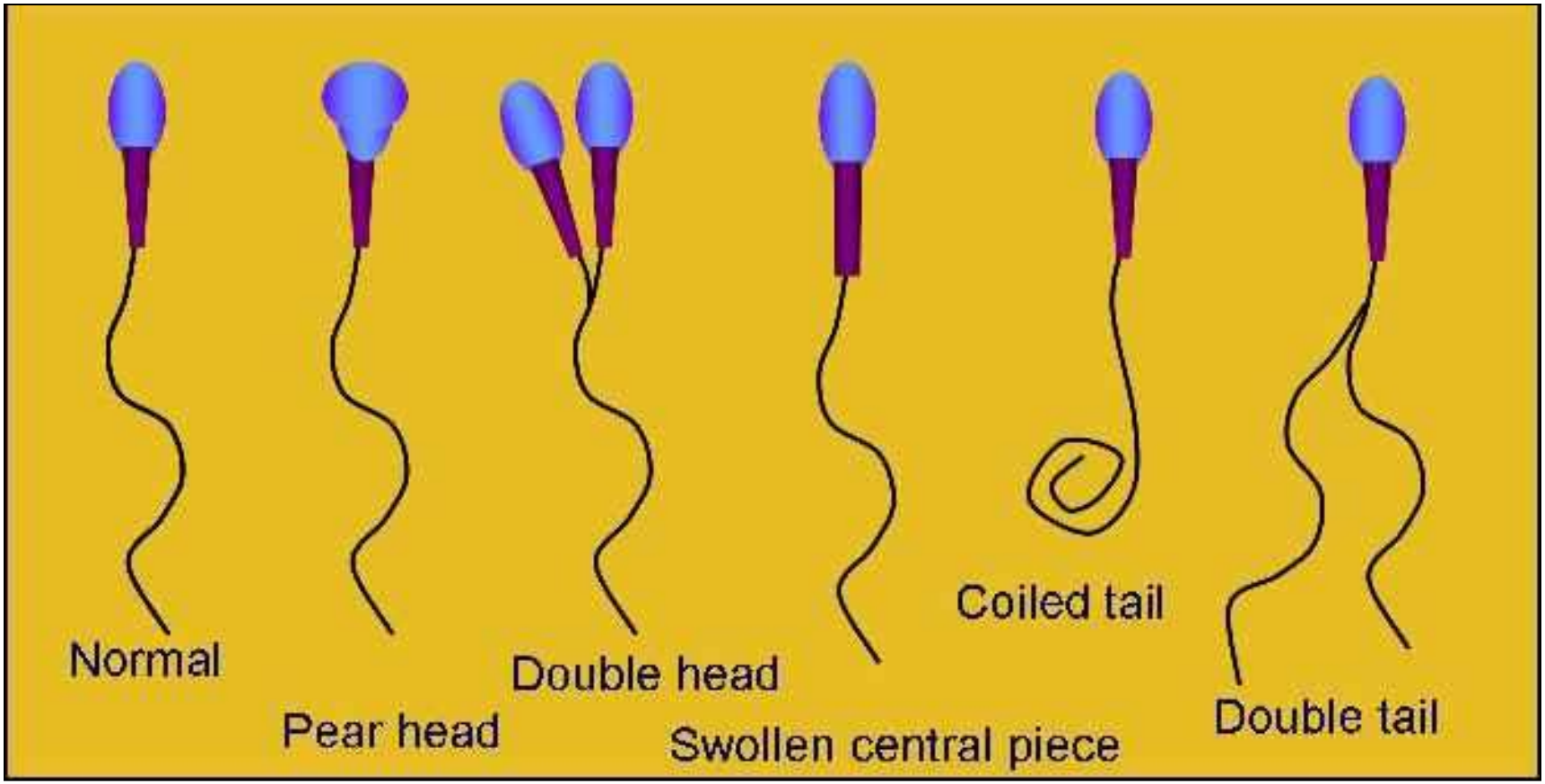



# SEMEN COLLECTION AND PROCESSING

## Quality control

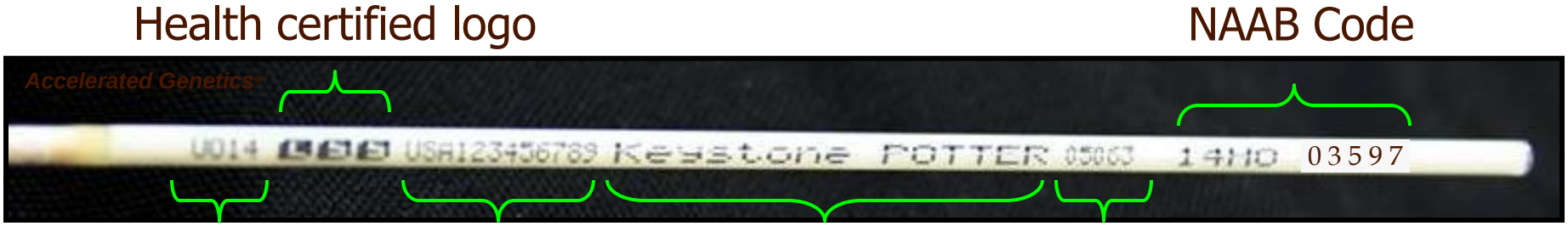
- 18 h after freezing two straws per batch are rigorously examined under microscope. If quality criteria are not met, the whole batch is discarded.

# MORPHOLOGIC ABNORMALITIES



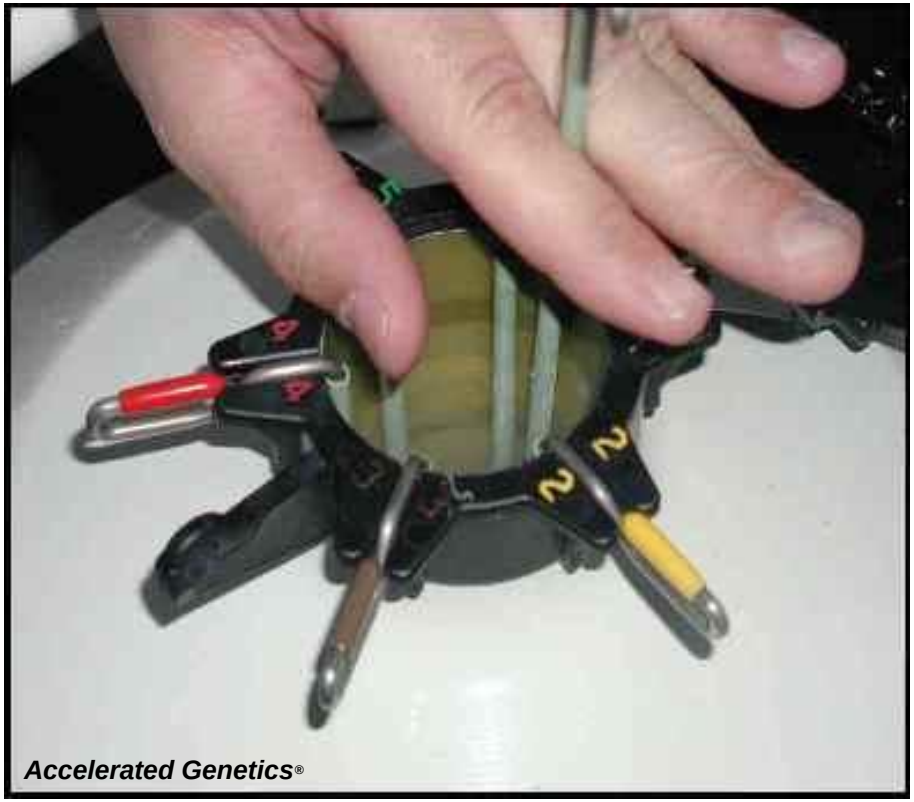
# SEMEN STRAW LABELING

Bovine semen straw



# ACCESSING SEMEN STRAWS

- Use your index and middle finger leaving your thumb free.
- Bring canister up only as far as needed to reach straws.



# SEMEN HANDLING

- Do not hold the straw with your fingers. Use the tweezers to get them out.

# SEMEN HANDLING

- If nitrogen boils when lowering the canister back into the tank, you are holding the canister up too long in the neck tube.
- Hold canister in neck tube a maximum of 7 seconds.

# CONSISTENCY

- Work Below Frost Line
- Work Under 5 Seconds
- Lower Canister if Delayed
- Use Tweezers

# FROST LINE RULE

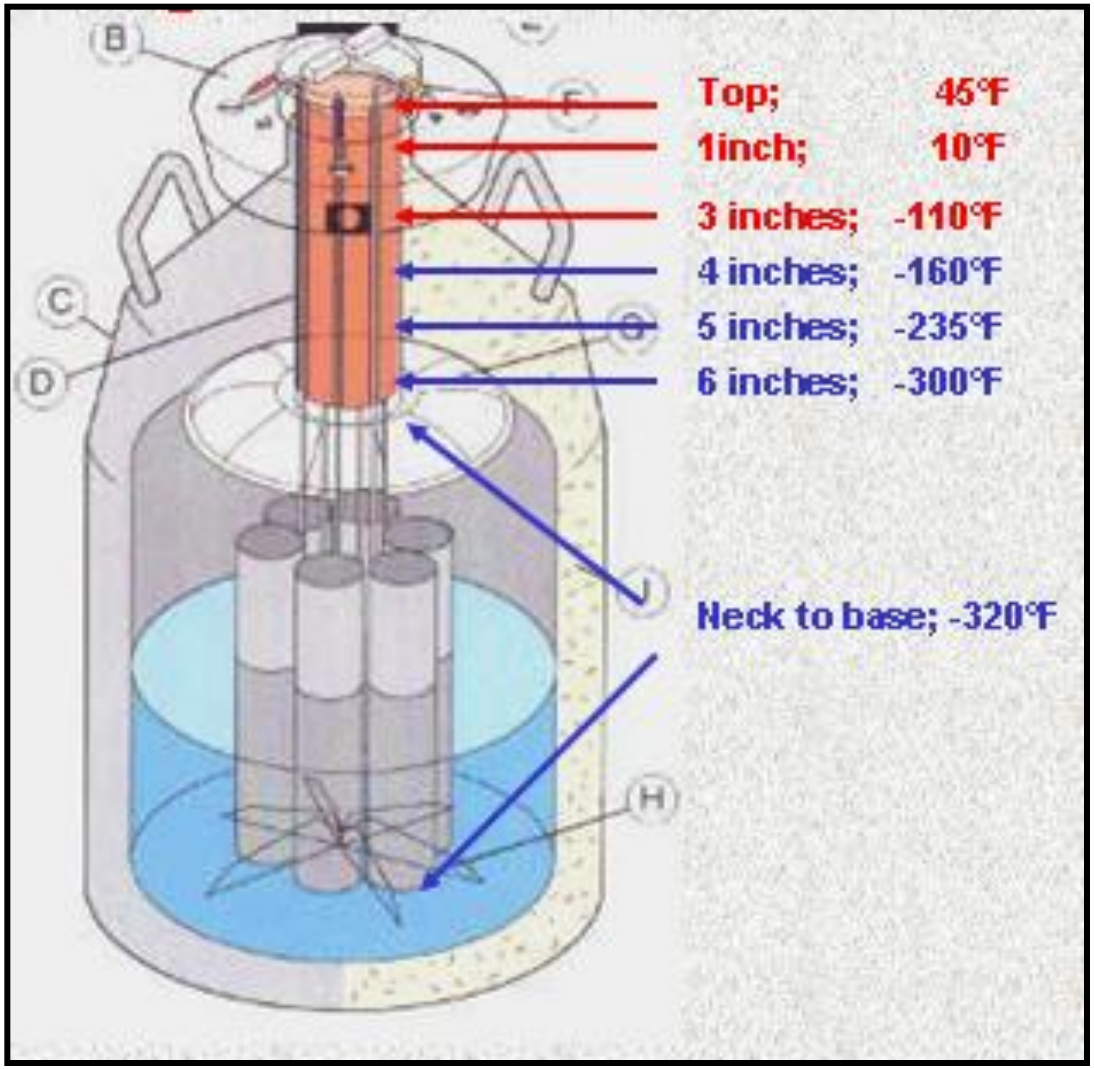
- Avoid Lifting The Canisters Above The Frost Line in The Neck Tube.

# CRITICAL TEMPERATURE

- Thawing and Re-Freezing Damages Cells
- Critical temperature range is -100 ℃ to -130 ℃

(-148 ℉ to -202 ℉)

# TEMPERATURE VARIANT



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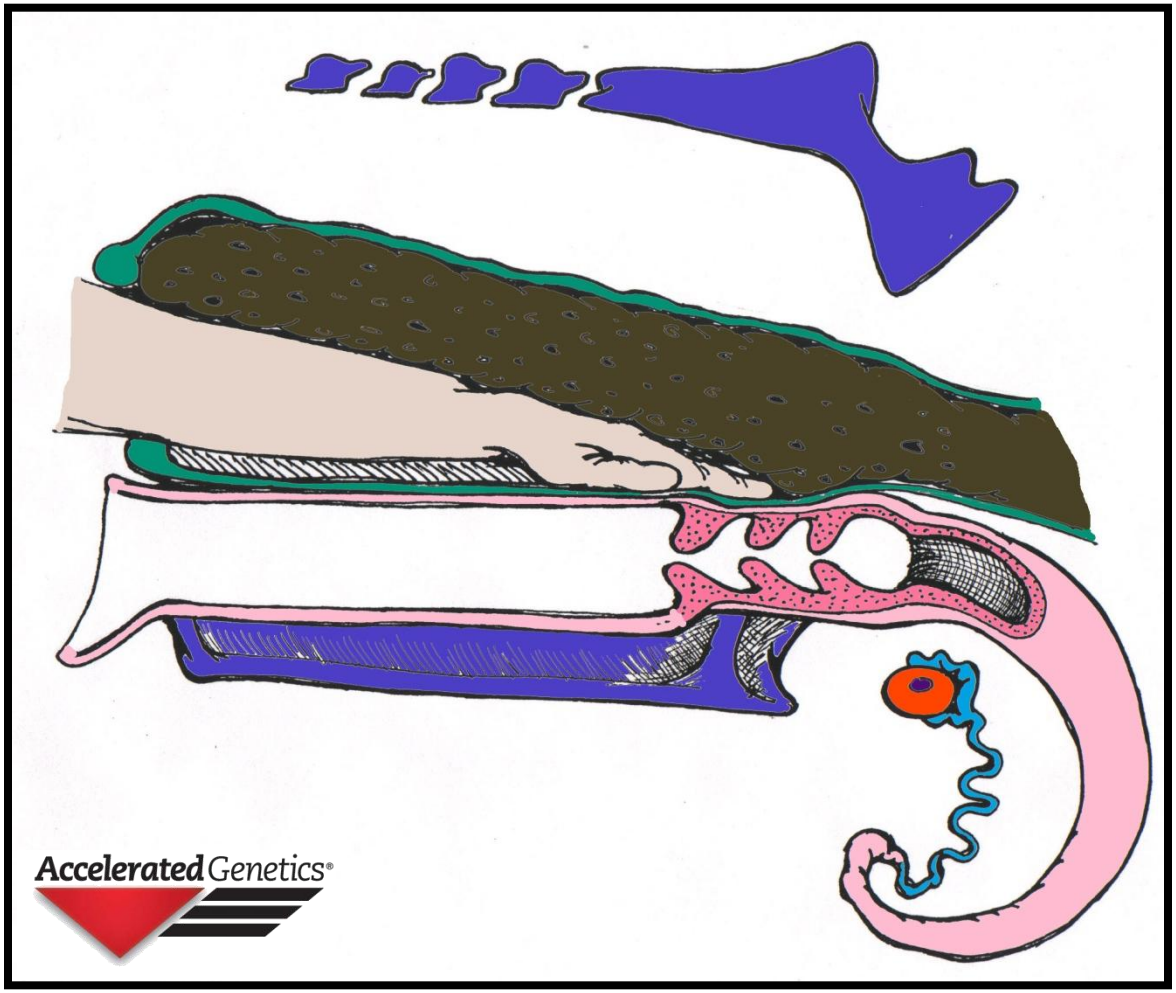
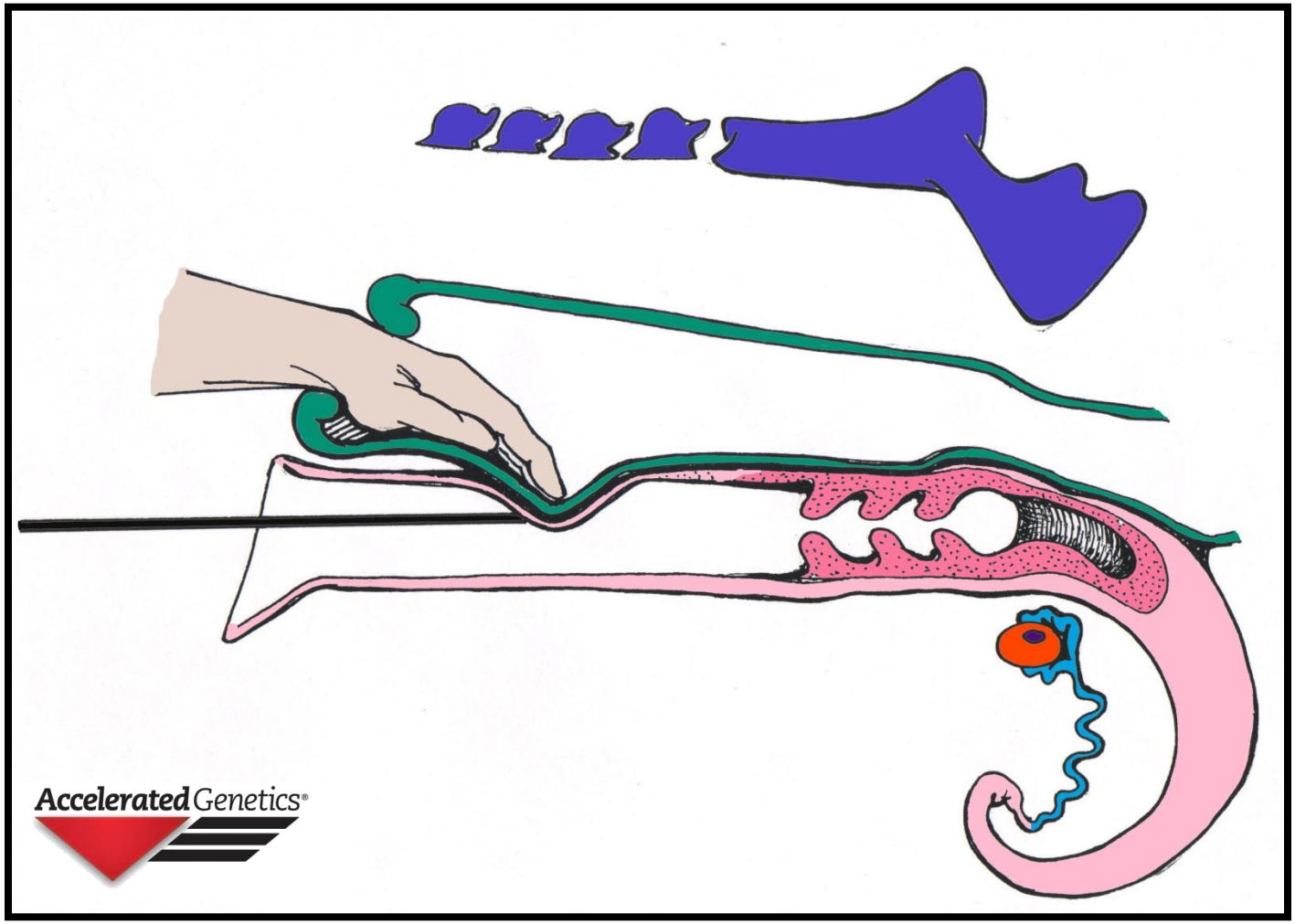
# ARTIFICIAL INSEMINATION TECHNIQUE CHAPTER 4

ARTIFICIAL INSEMINATION TRAINING PROGRAM

# FINDING THE CERVIX

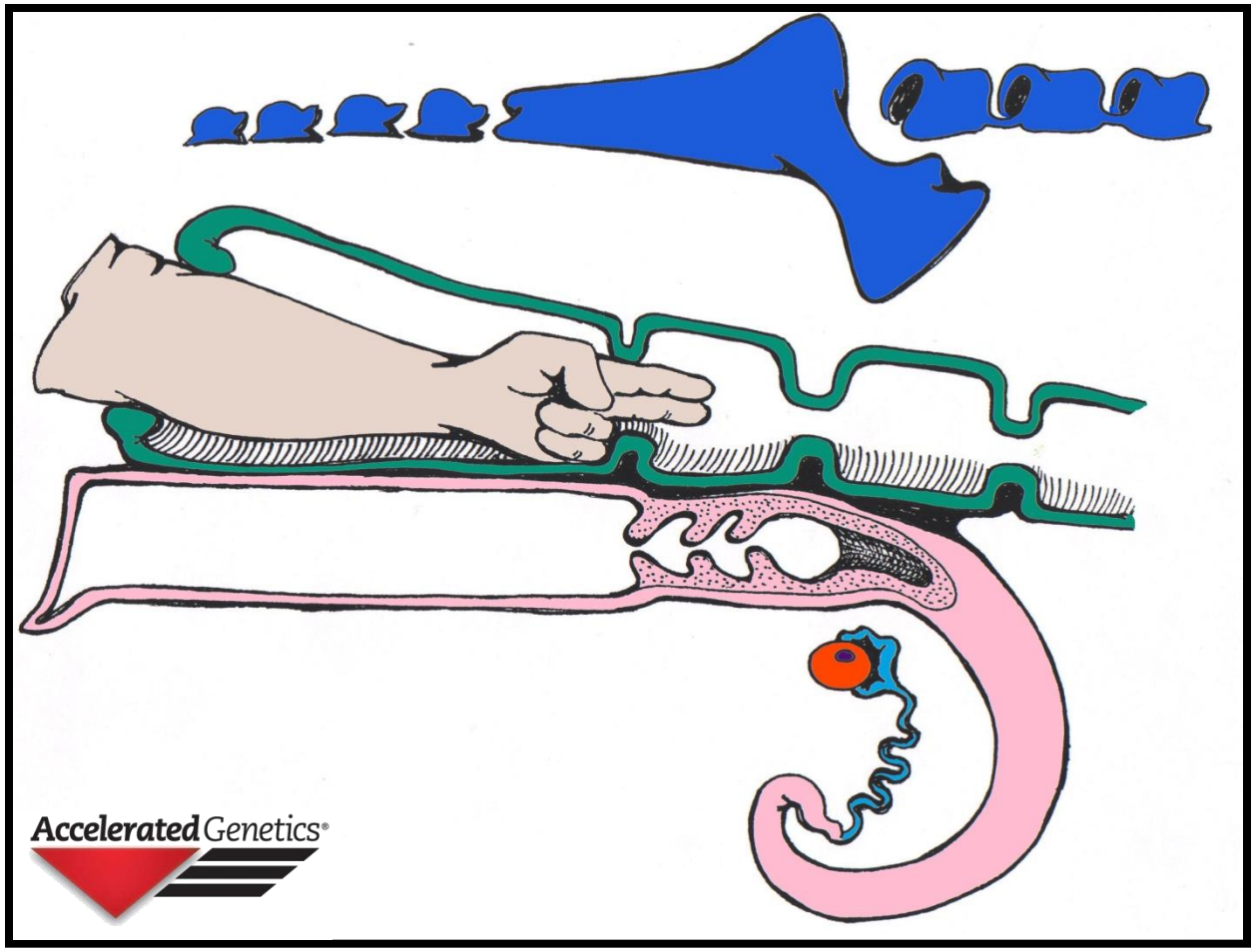


# ALWAYS BE AWARE OF THE LOCATION OF THE TIP OF THE GUN.



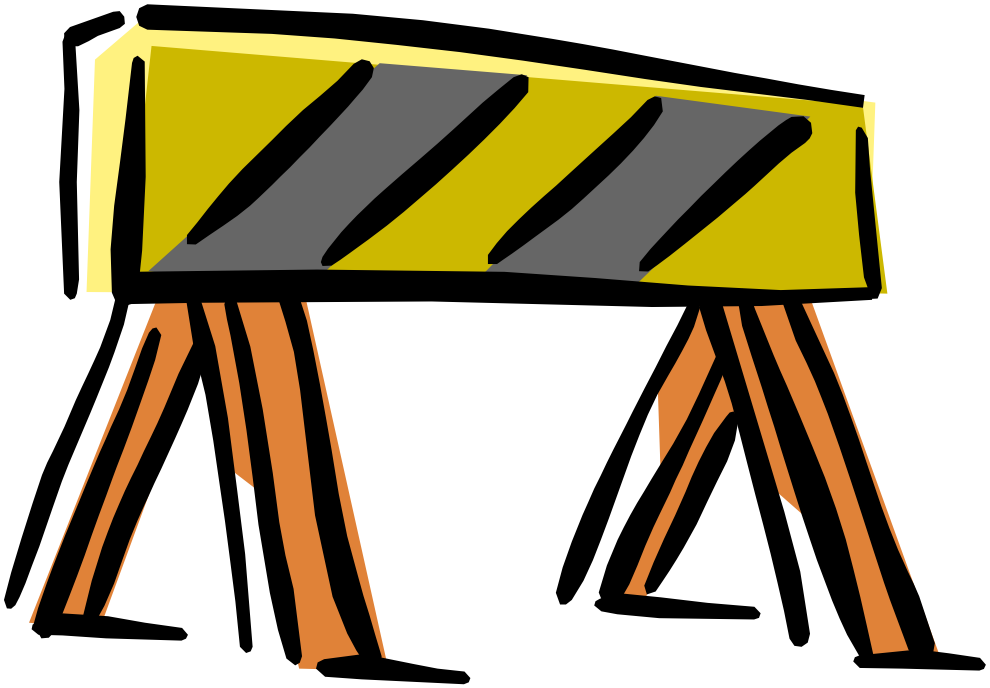
# CONSTRICTING RINGS

- To relax constricting rings, put two fingers through the center of a ring and massage back and forth.

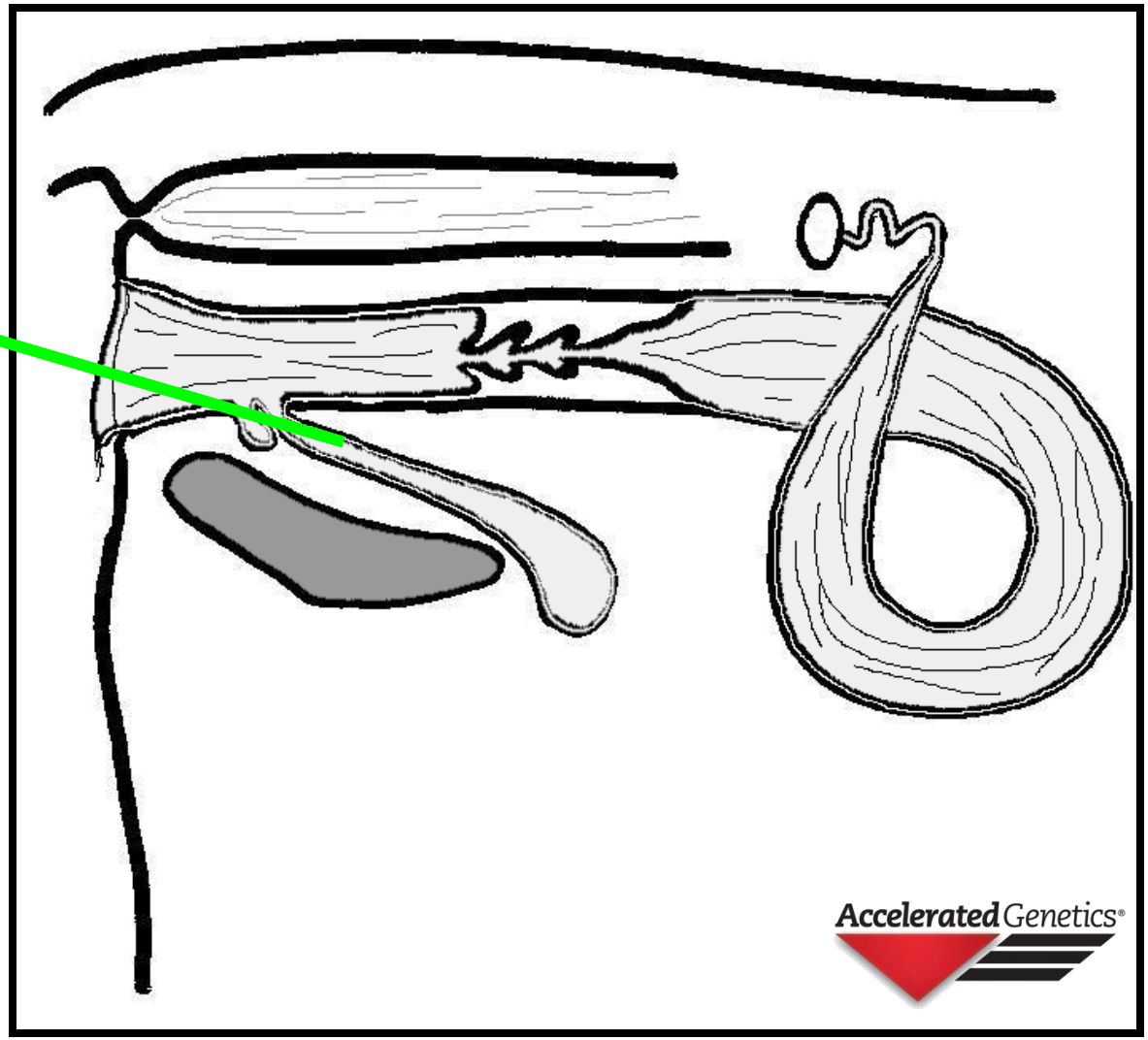


# NATURAL OBSTRUCTIONS

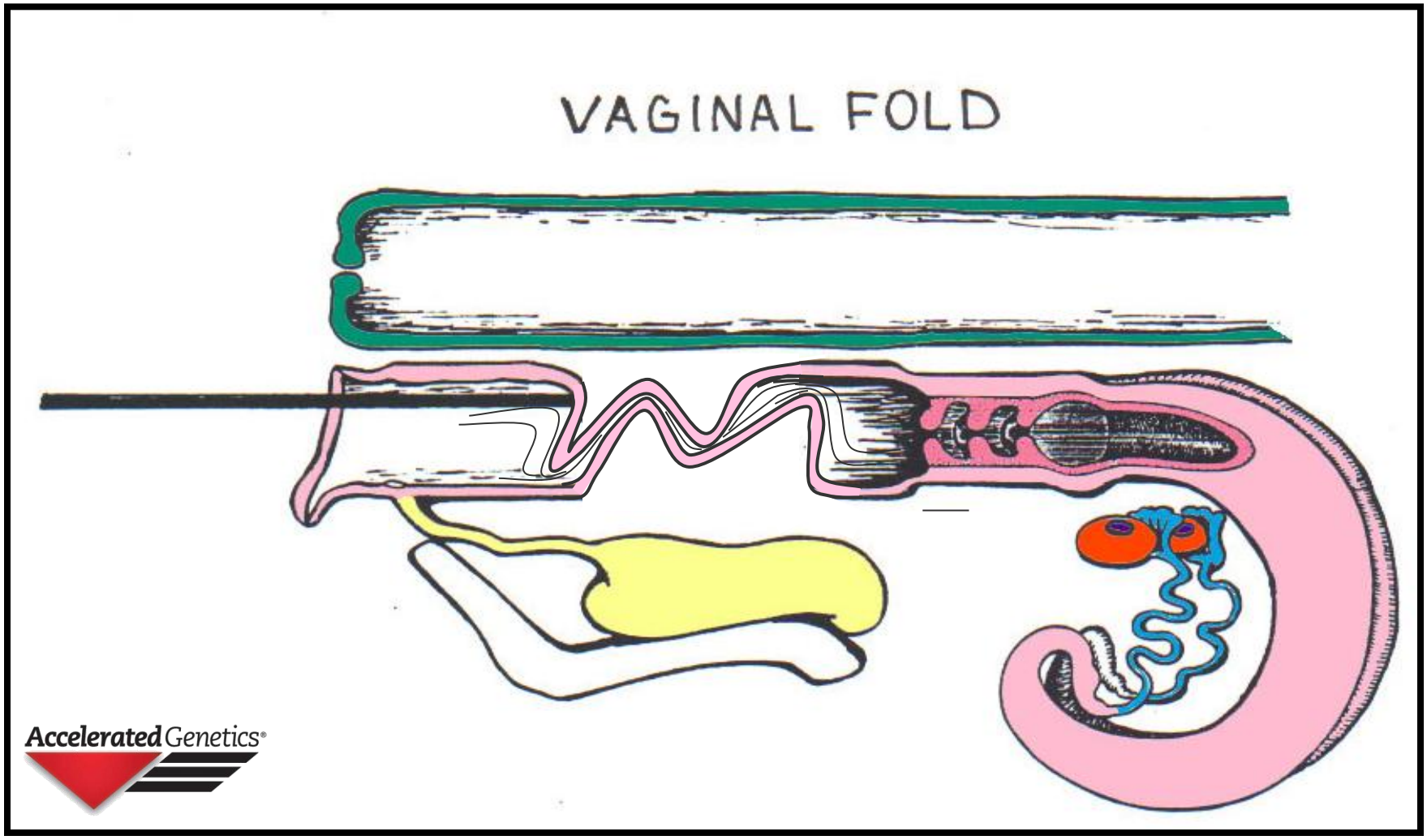
- Blind pouch
- Cervical rings
- Vaginal folds



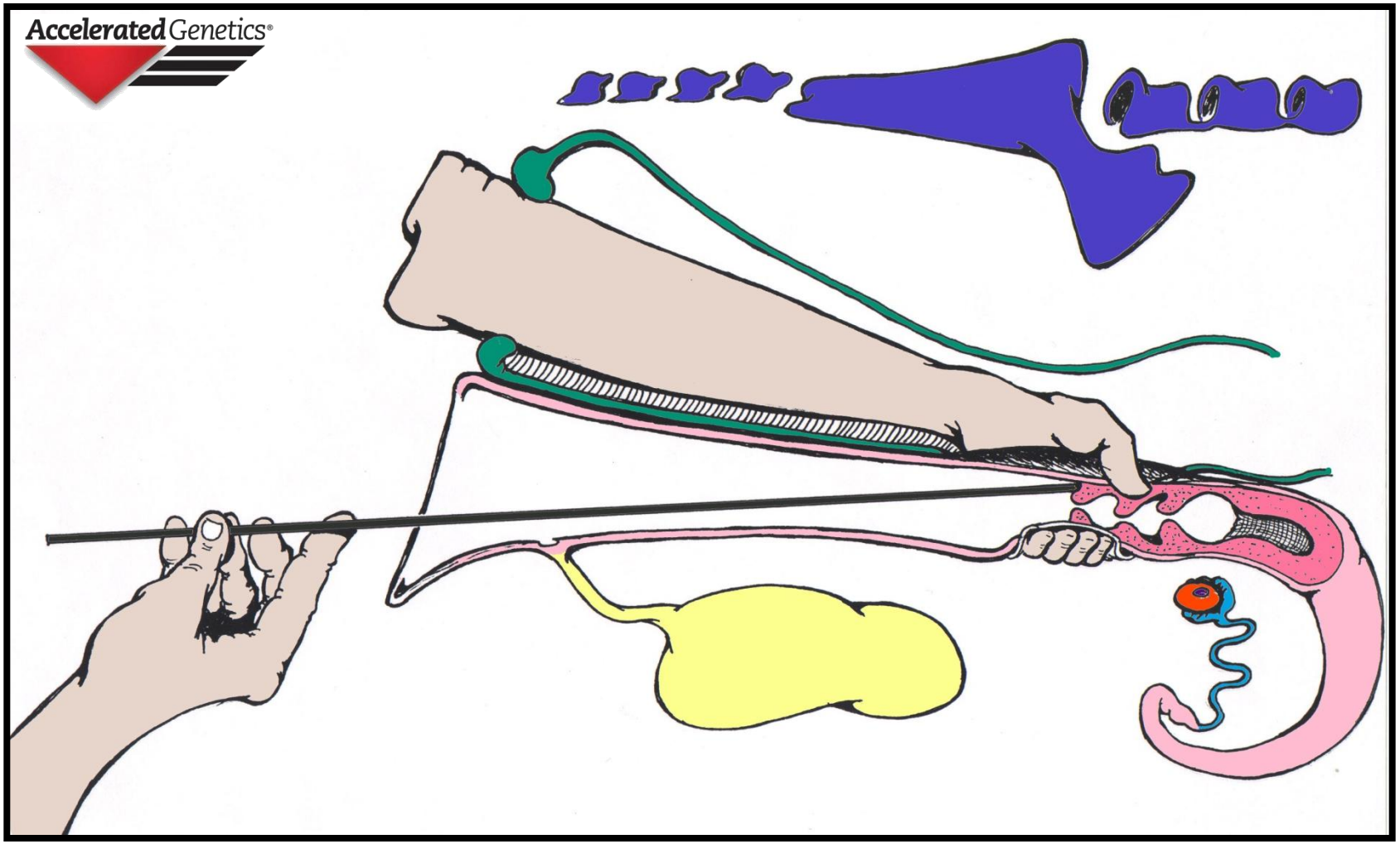
# BLADDER AND SUB URETHRAL DIVERTICULUM



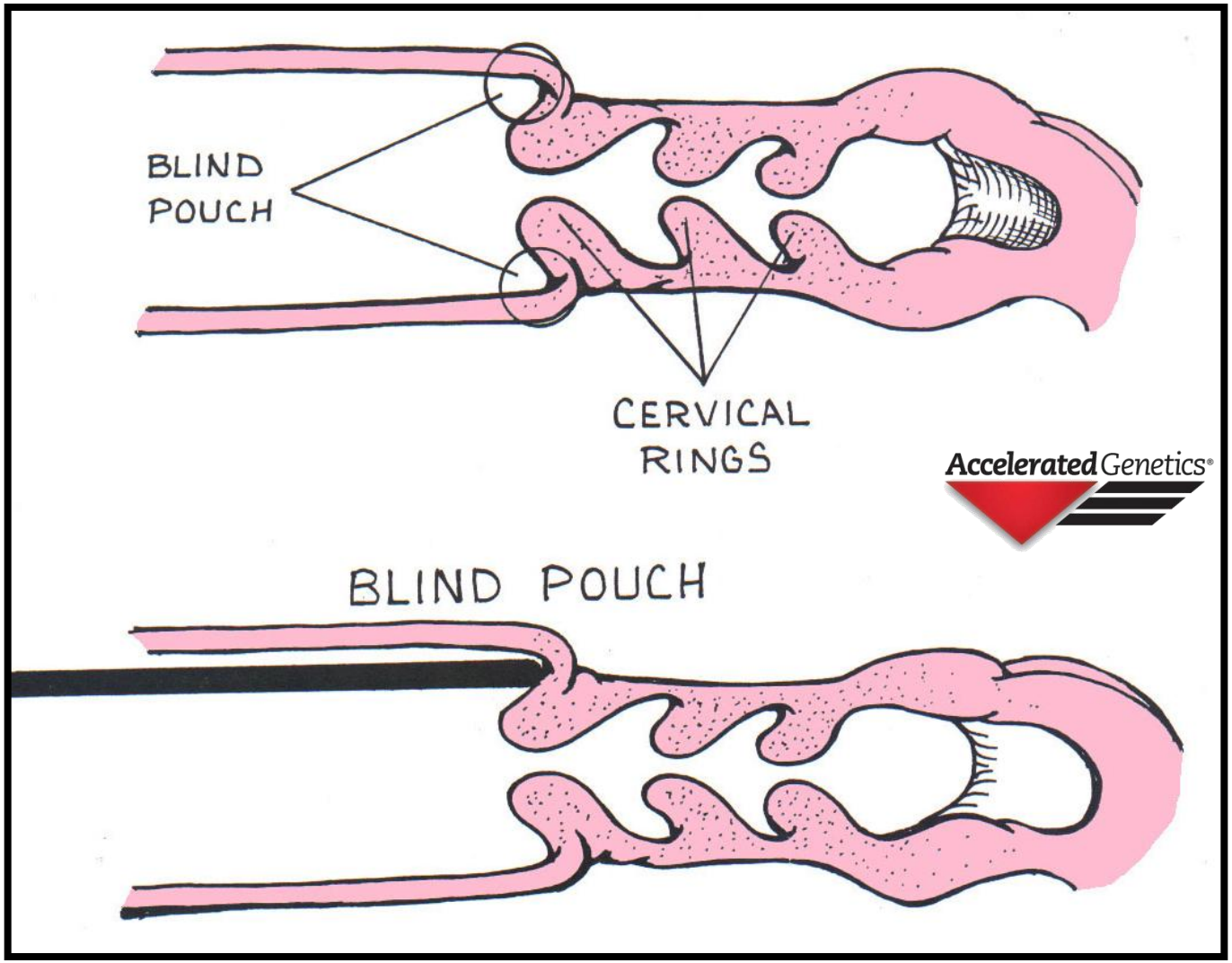
# VAGINAL FOLDS



# BLIND POUCH

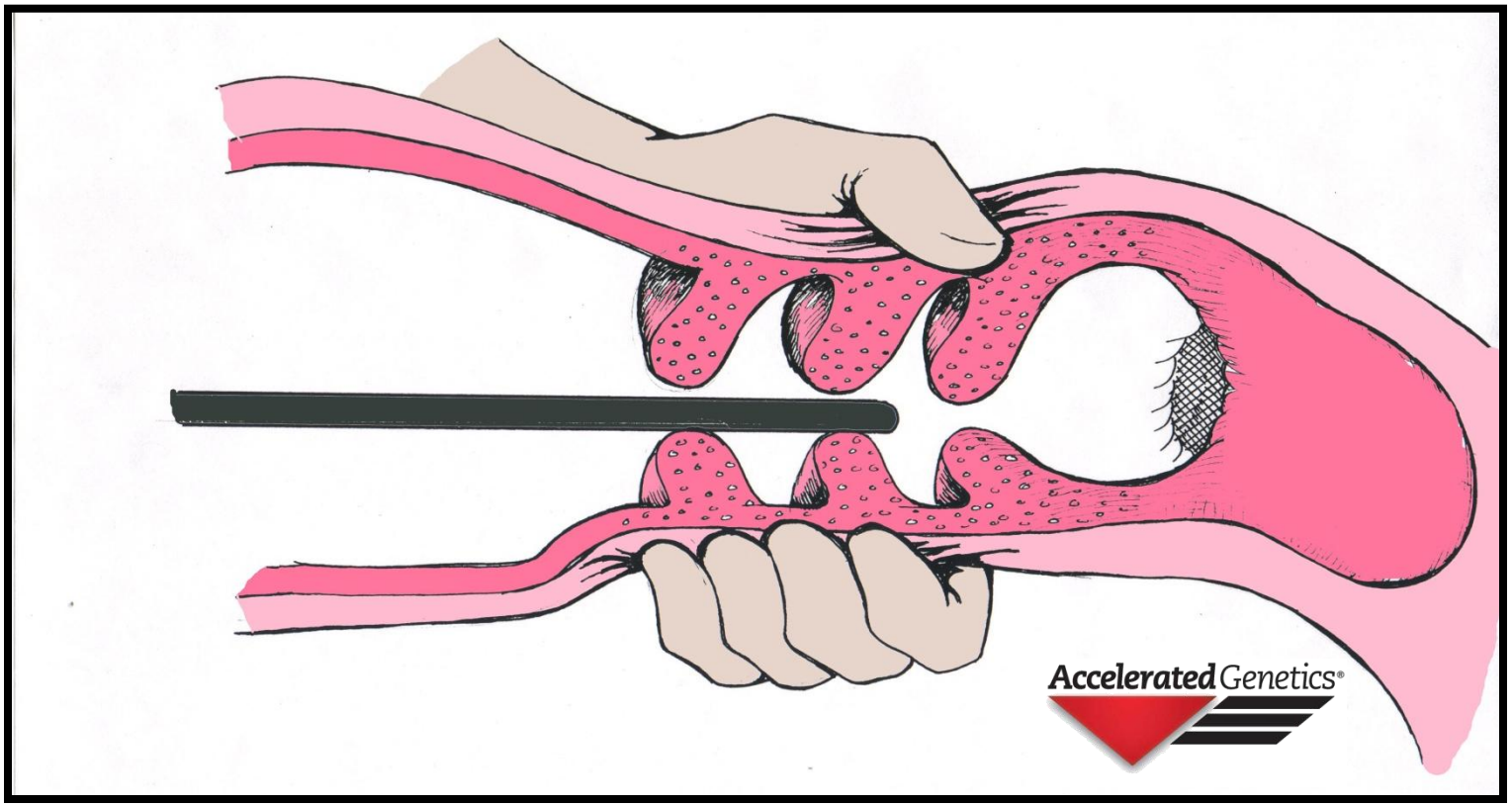


# BLIND POUCH AND CERVICAL RINGS



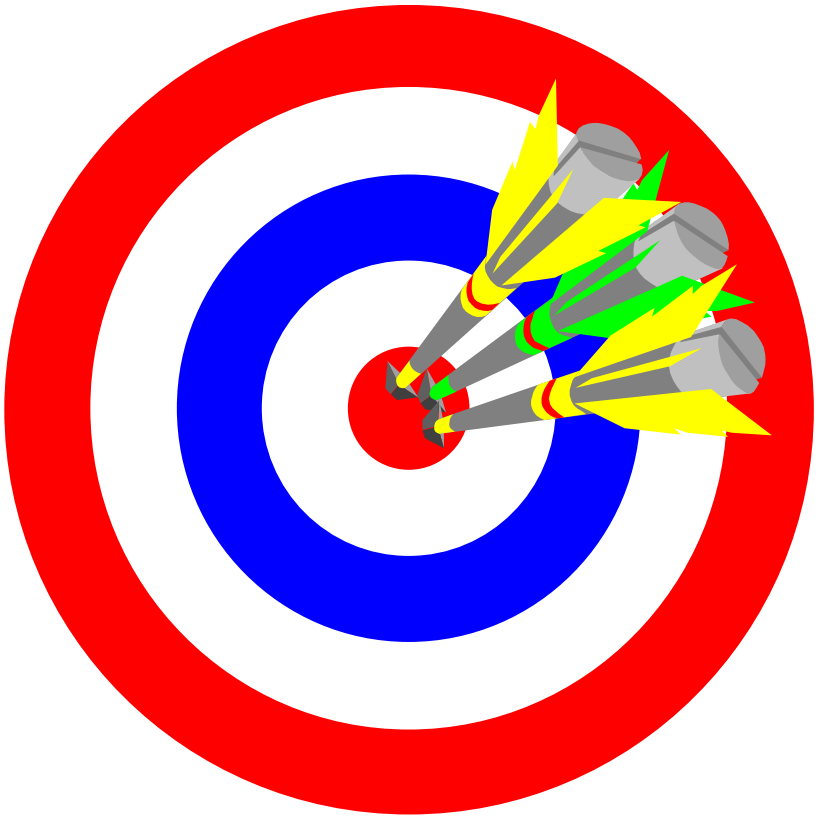
# MANIPULATING THE CERVIX

- The cervix is placed over the gun, not the gun inserted through the cervix.

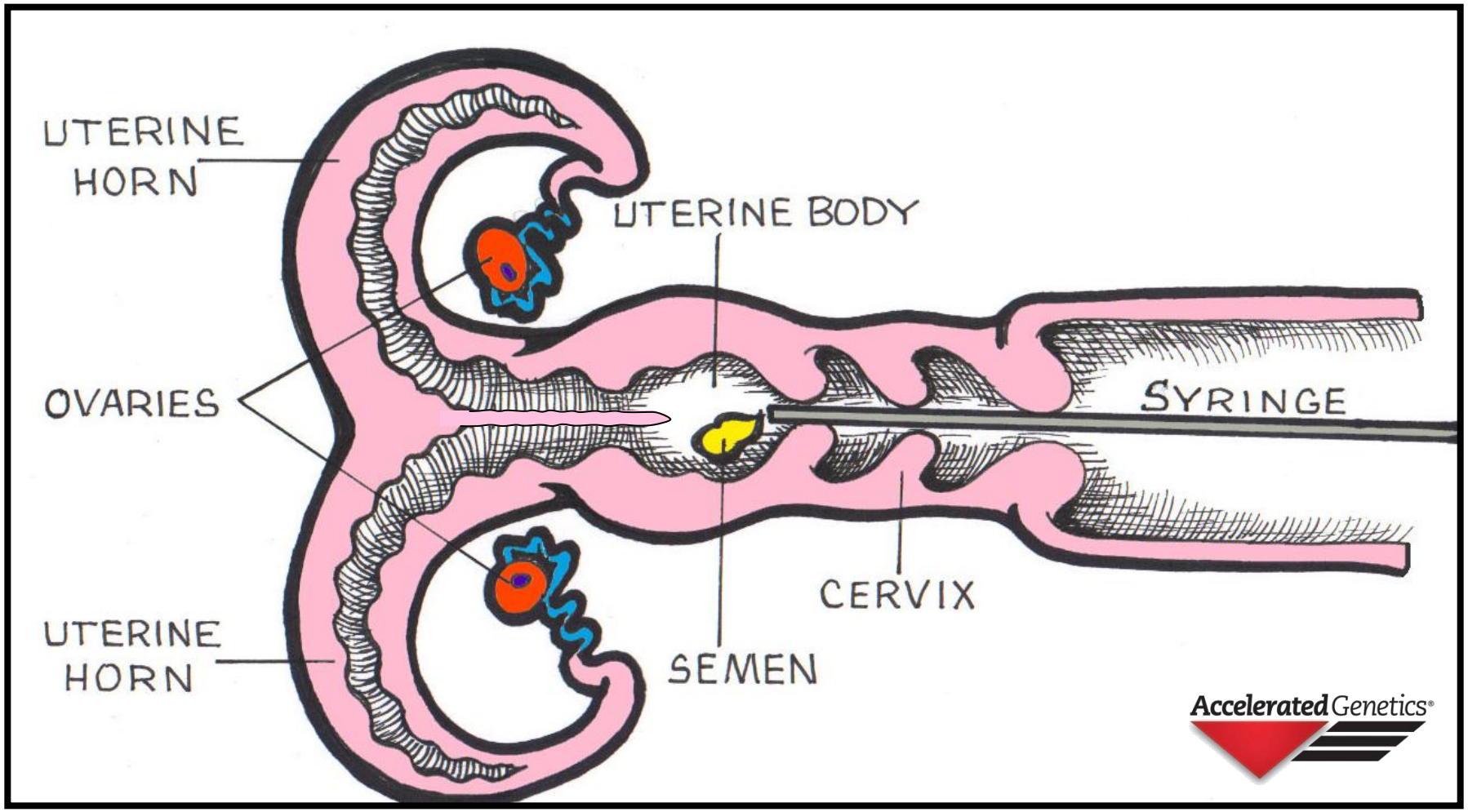


# LOCATING THE TARGET

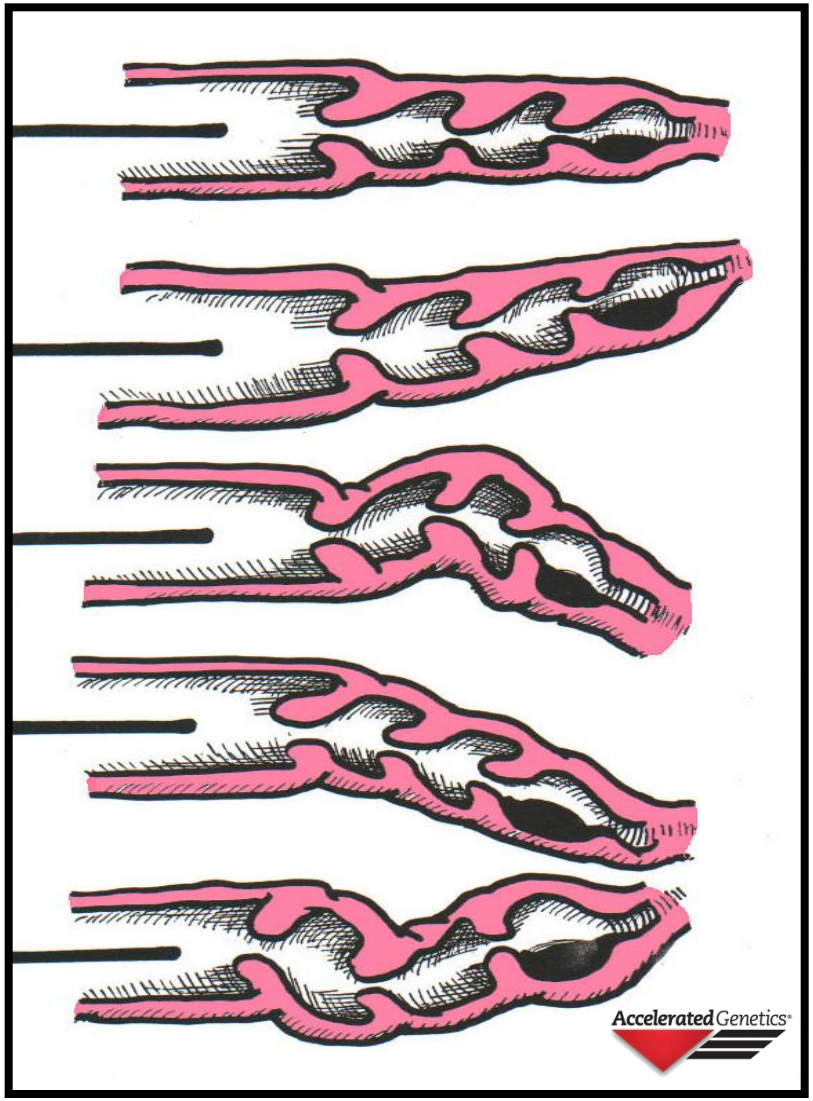
- When all rings of the cervix have been cleared, the gun should slide forward freely.
- Since the uterine wall is very thin, you will once again be able to feel the insemination gun.



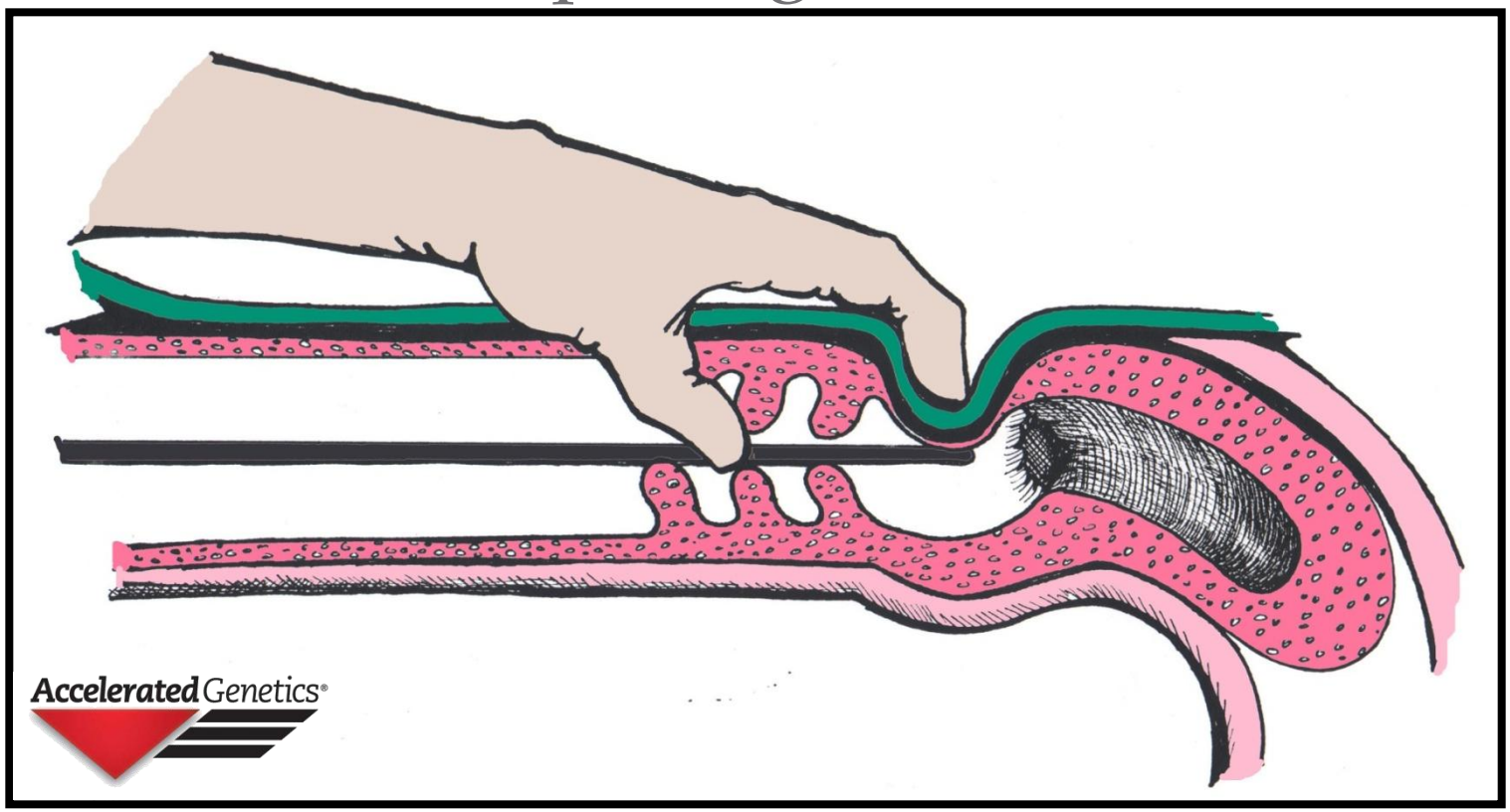
# THE TARGET


UTERINE HORN
UTERINE BODY
OVARIES
SYRINGE
CERVIX
UTERINE HORN
SEMEN
Accelerated Genetics

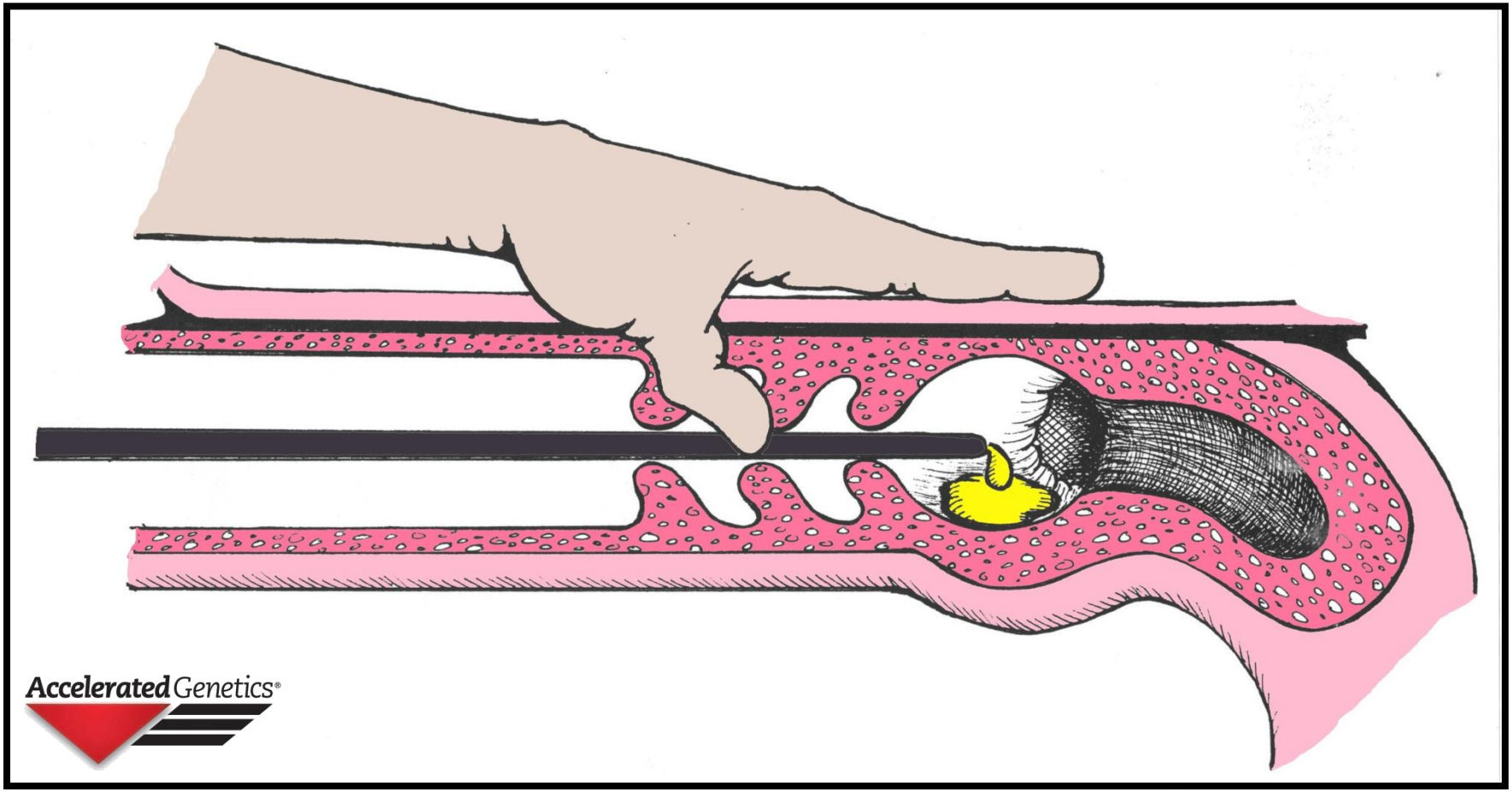
# CERVIX SHAPES



Pull back on the gun until you feel the tip directly underneath your finger near the internal opening of the cervix.



# Raise your finger slowly and deposit the semen

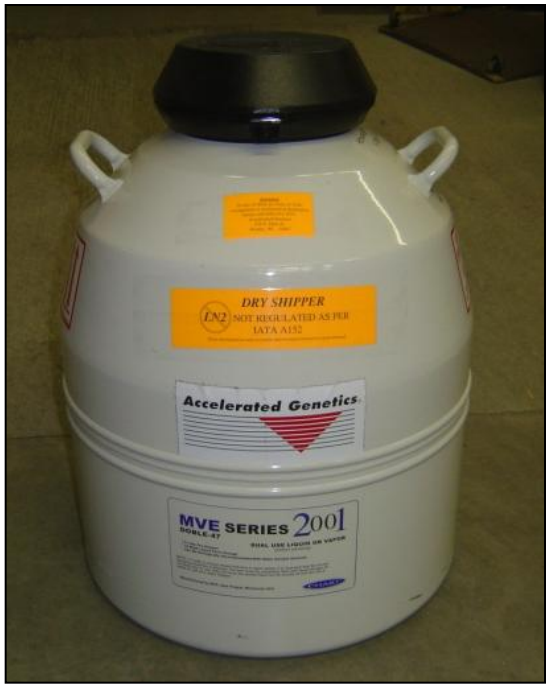


# ARTIFICIAL INSEMINATION EQUIPMENT AND ITS CARE CHAPTER 5

ARTIFICIAL INSEMINATION TRAINING PROGRAM

# SHIPPER TANKS

- Shippers are not intended for long term storage.
  - Transfer immediately to your work tank

# FIVE SECONDS RULE

When moving semen from one tank to another, try to limit exposure outside of tank to under 5 seconds.

# EQUIPMENT NEEDED

- Liquid Nitrogen Tank
  - Many sizes to choose from depending on your needs.
- 4-month or 6-month tank recommended depending on availability of liquid nitrogen.

# TANK CARE

- Store in a dry, well-ventilated area
  - Nitrogen displaces oxygen
- Place on board or off concrete to prevent corrosion to bottom of tank.

# SEMEN TANK

Know your tank inside and outside

A.Cap

B.Cap rester

C.External shield

D.Neck

E.Lock holder

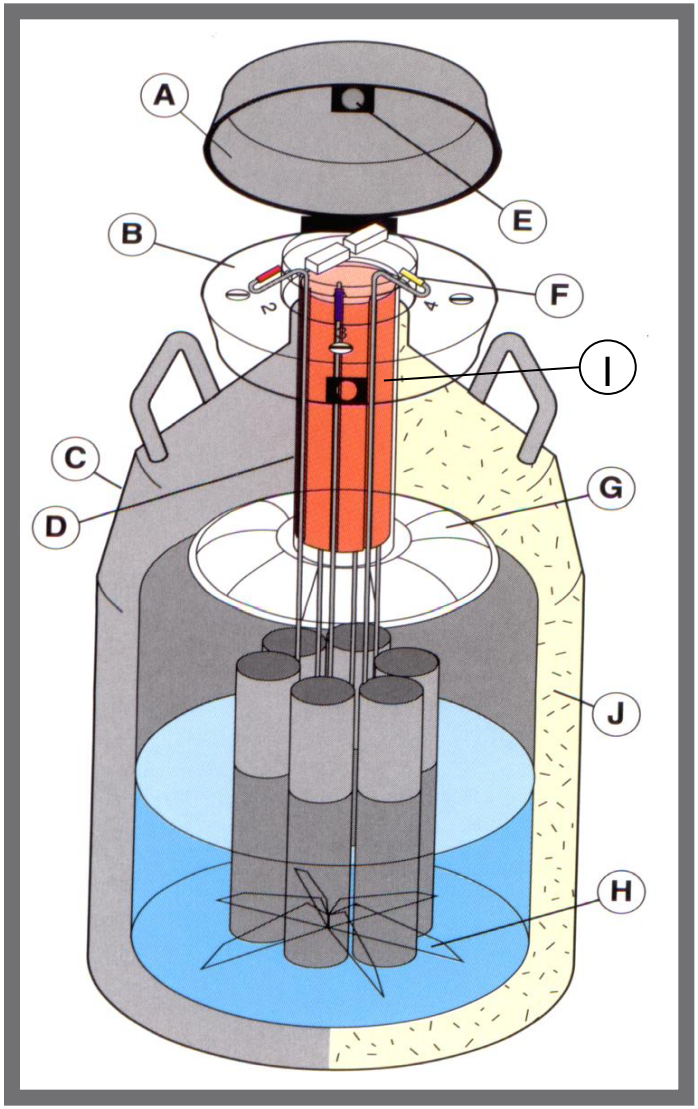
F.Canister handle

G.Vacuum retention system

H.Index spider

I.Cork

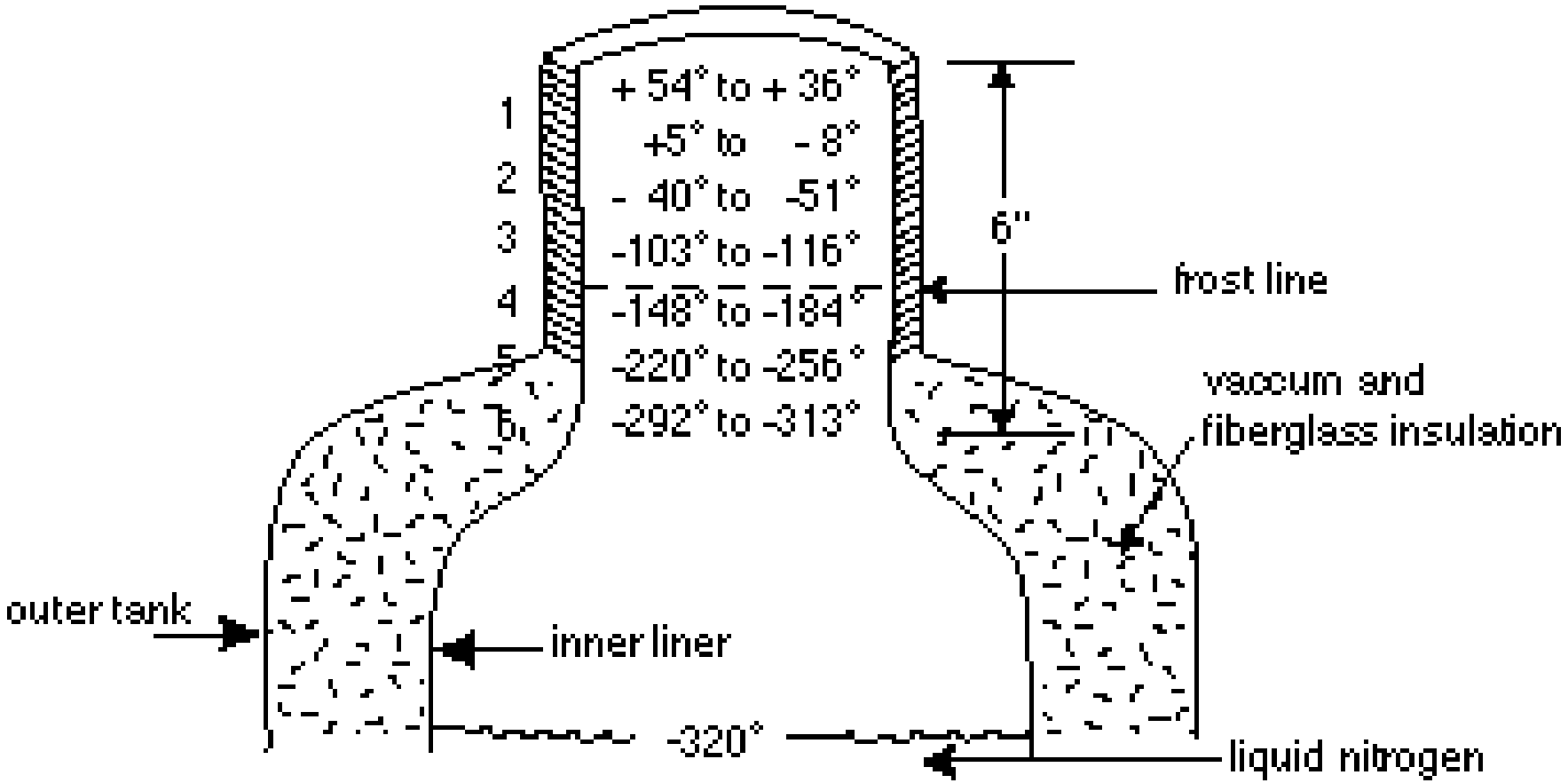
J.Insulation



# MORE ABOUT THE SEMEN TANK

- LN2 evaporates colorless, odorless and tasteless. It may cause suffocation in poorly ventilated areas
- Inside vacuum may last up to 10 years in well managed tanks.
- Cork cannot be hermetical to allow for the normal LN2 evaporation. it may explode!!
- The neck is the weakest point. Avoid sudden movements, and be gentle when moving it .
- If the outer shell frosts, the vacuum has been lost and you have a few hours to transfer the semen to another tank
- Keep an accurate inventory… you cannot physically count your straws by hand!!

# SEMEN TANK


1
2
3
4
5
6
+ 54° to + 36°
+5° to - 8°
- 40° to -51°
-103° to -116°
-148° to -184°
-220° to -256°
-292° to -313°
6"
frost line
vaccum and
fiberglass insulation
outer tank
inner liner
-320°
liquid nitrogen

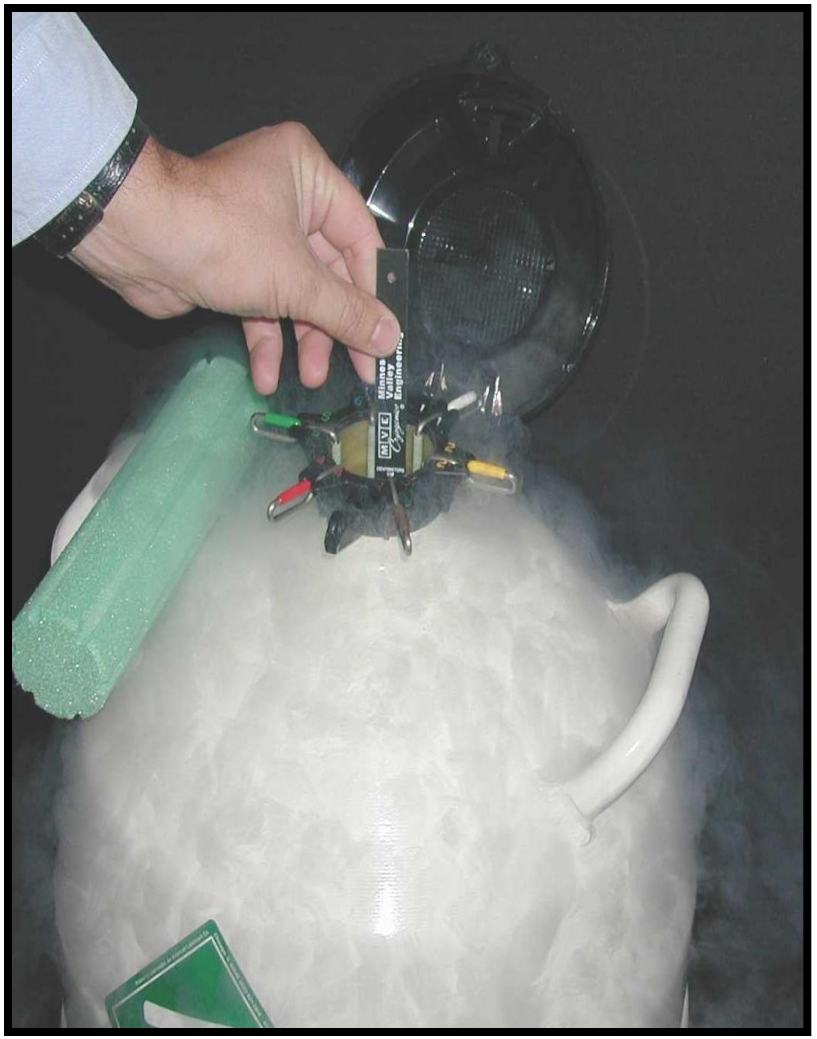
# KEEP TANK LOCKED

- Child Safety
- Quality Control
- Protect Investment

- All tanks come with an LN2 measuring stick to monitor tank performance.

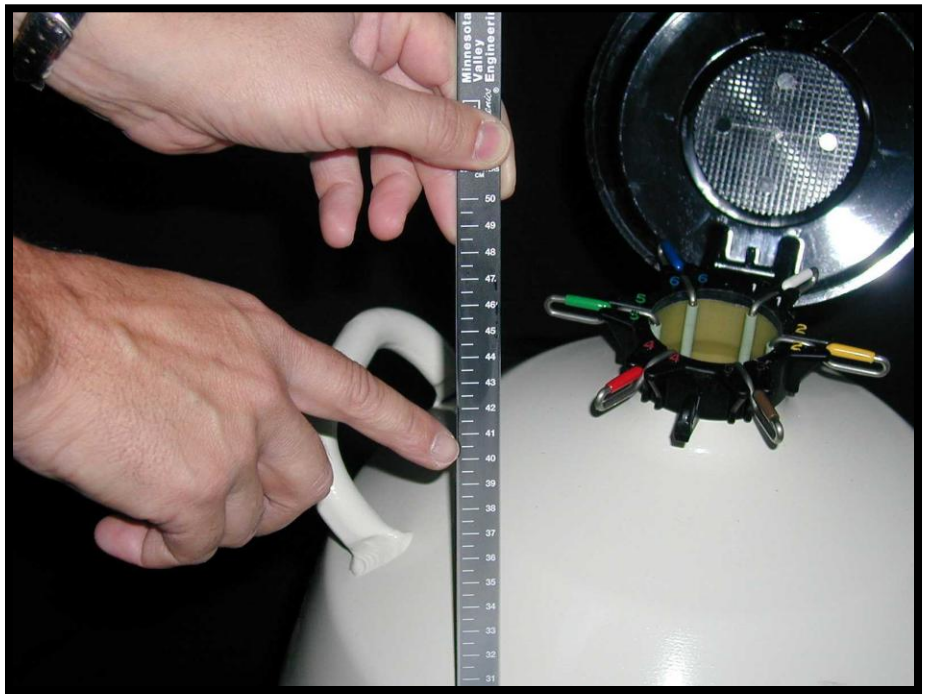
# MEASURING LN2 LEVELS

- Drop plastic measuring stick into the center of the neck tube all the way to the bottom until the nitrogen stops boiling.



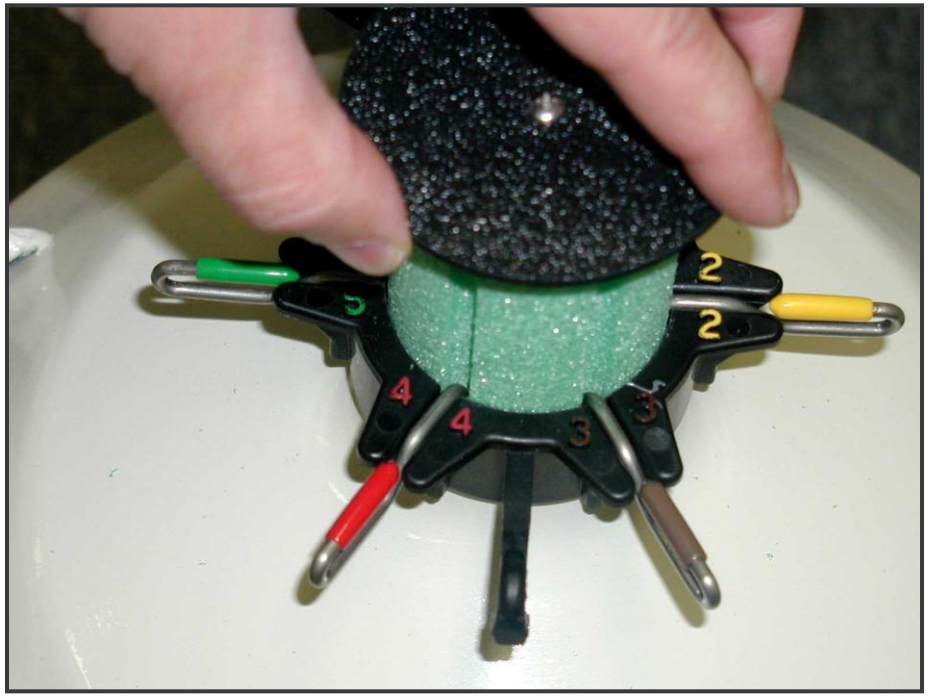
# READING LN2 LEVELS

- Remove stick and read the frost level as shown here.
- Tank should be checked a minimum of once a week.



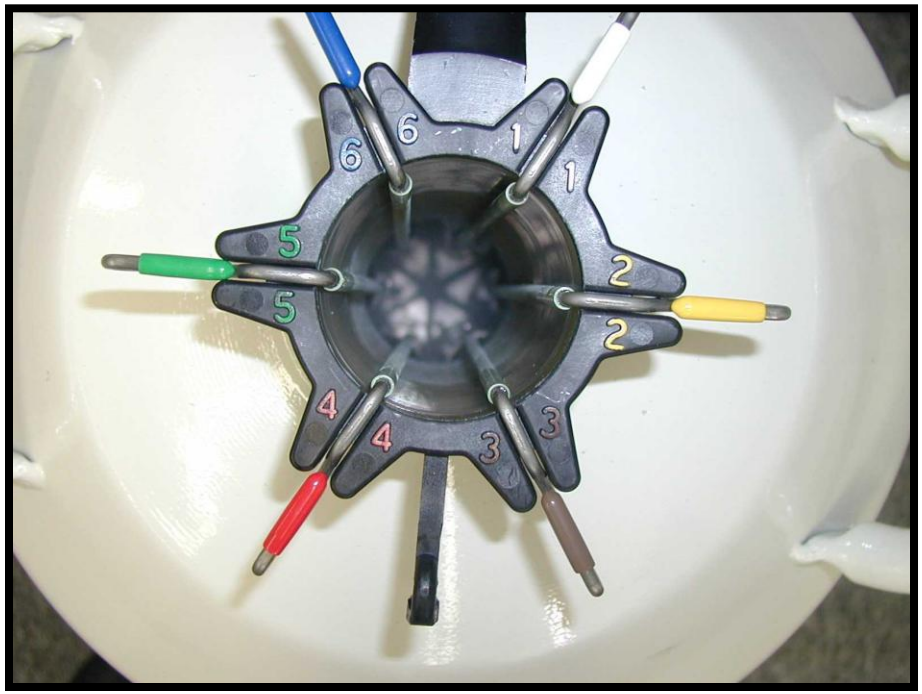
# NECK TUBE CORK

- Remove by lifting straight up.
- Grooved to accommodate canisters.



# INDEX SPIDER

- Holds canisters in place.
- Located on bottom of tank.
- Lift canister towards middle of neck tube and up to access semen.

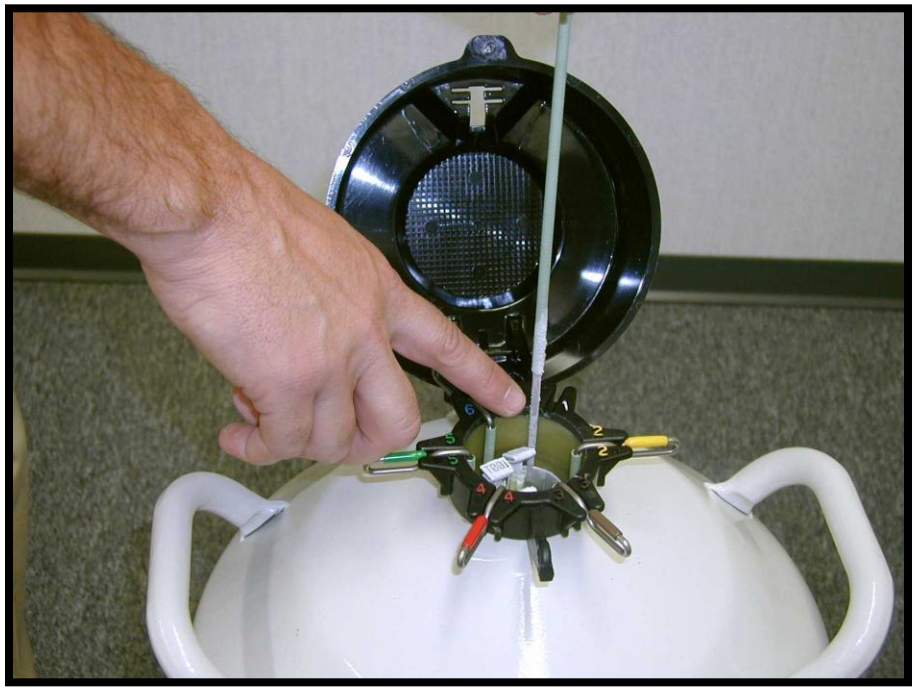


# CANISTER HANDLING

- Canisters have a fiberglass protective covering to prevent frost bite on your fingers.

# BURN PREVENTION

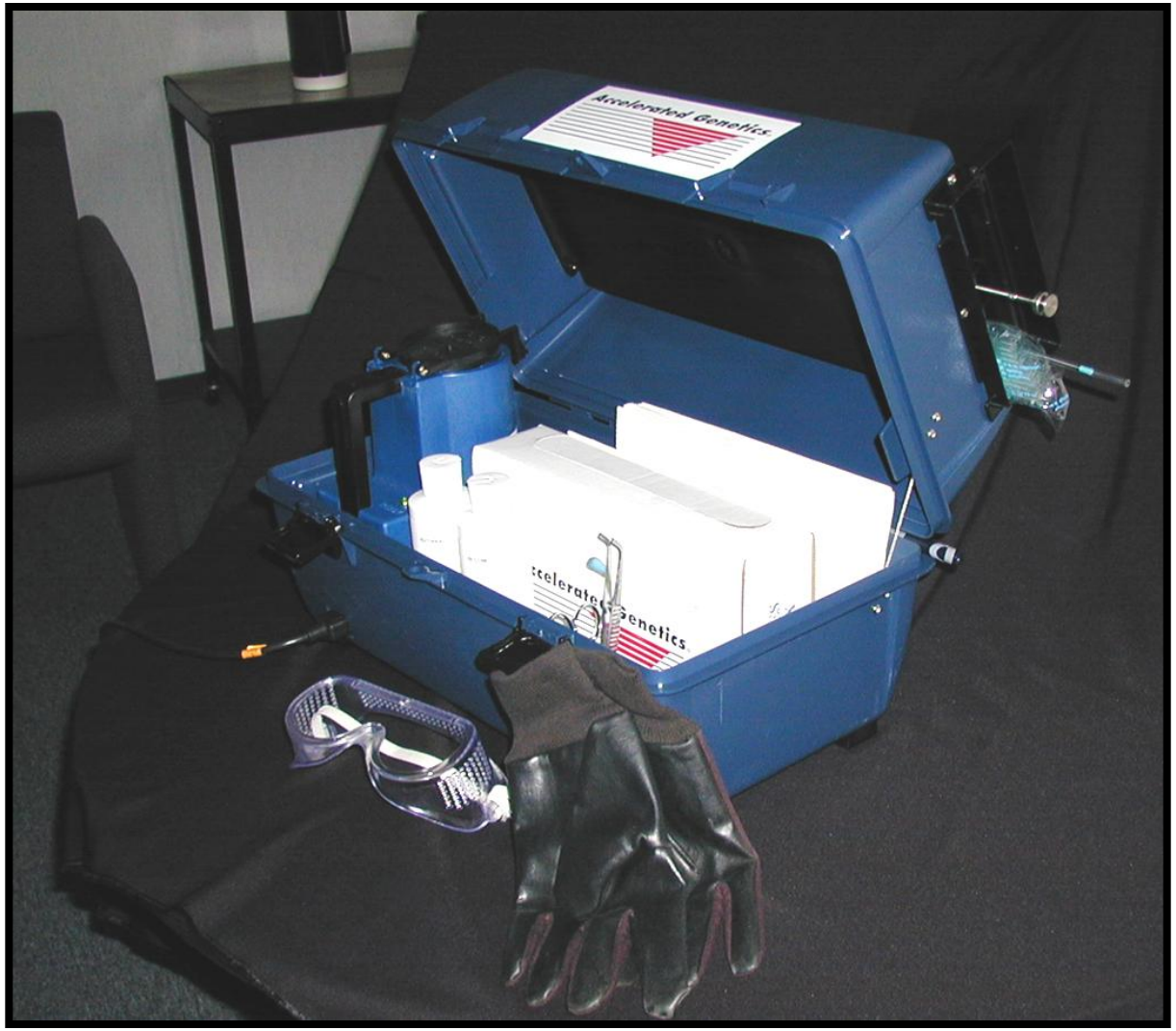
- Do not hold onto the metal part of the canister at any time as frostbite will occur.



# TANK SAFETY

- Use of protective gloves is recommended to prevent injury to skin.
- Temperature of LN2 is -320 degrees Fahrenheit and -196 Celsius.
- Handle LN2 like you would handle boiling water.

# BREEDING KIT



# NECESSARY EQUIPMENT

- Thaw Unit
- Lube
- Gloves
- Insemination gun
- Paper towels
- Cito cutter or scissors
- Sheaths
- Tweezers

# THAW UNIT

- Either an electric thaw unit or good reliable thermos are necessary to thaw semen.
- NOTE- remember that the goal is to maintain constant water temperature.

# THERMOMETER

- Always have an accurate thermometer with any type of thaw unit.

# A **RED** LIGHT INDICATES THAW UNIT IS **NOT** READY FOR SEMEN

# A **GREEN** LIGHT INDICATES THE THAW UNIT **IS** READY FOR SEMEN

# AI GUN WARMER

# OUTLINE

1. Reproductive Anatomy of the Cow
2. Reproductive Physiology of the Cow
3. Semen Processing
4. Artificial Insemination Technique
5. AI Equipment and its Care
6. **Preparing AI Equipment for Breeding**
7. **Inseminating the Cow**
8. **Records**

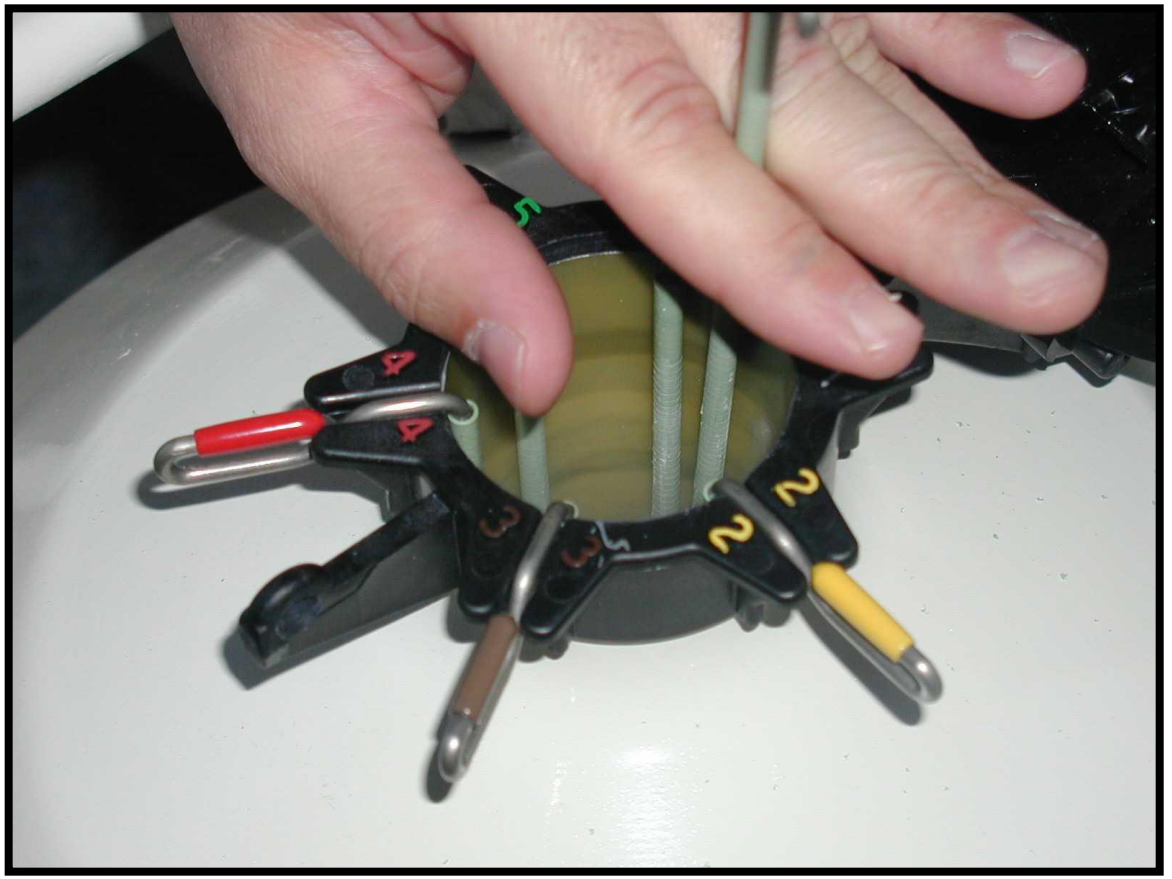
# PREPARING YOUR ARTIFICIAL INSEMINATION EQUIPMENT FOR BREEDING CHAPTER 6

ARTIFICIAL INSEMINATION

TRAINING PROGRAM

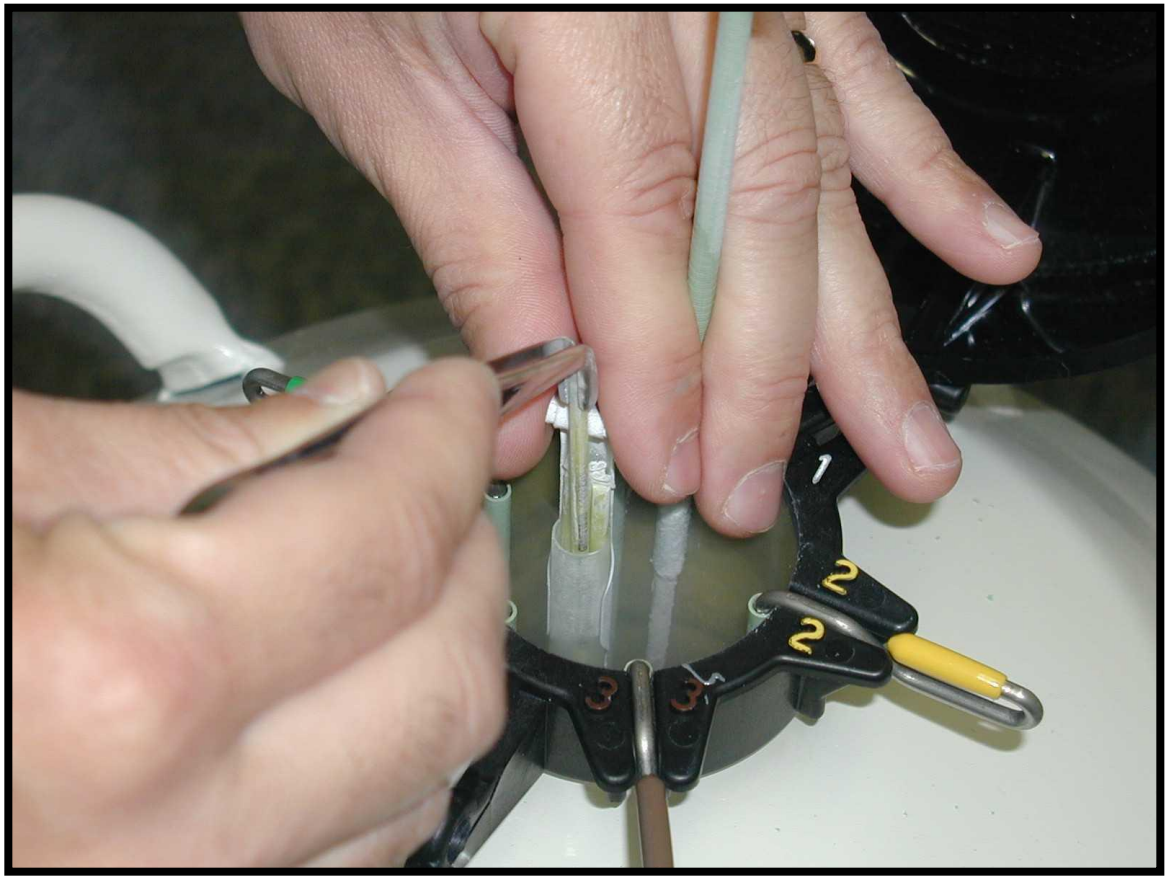
# STEP 1

- Use index and middle finger to hold canister…your **<u>thumb</u>** remains free.



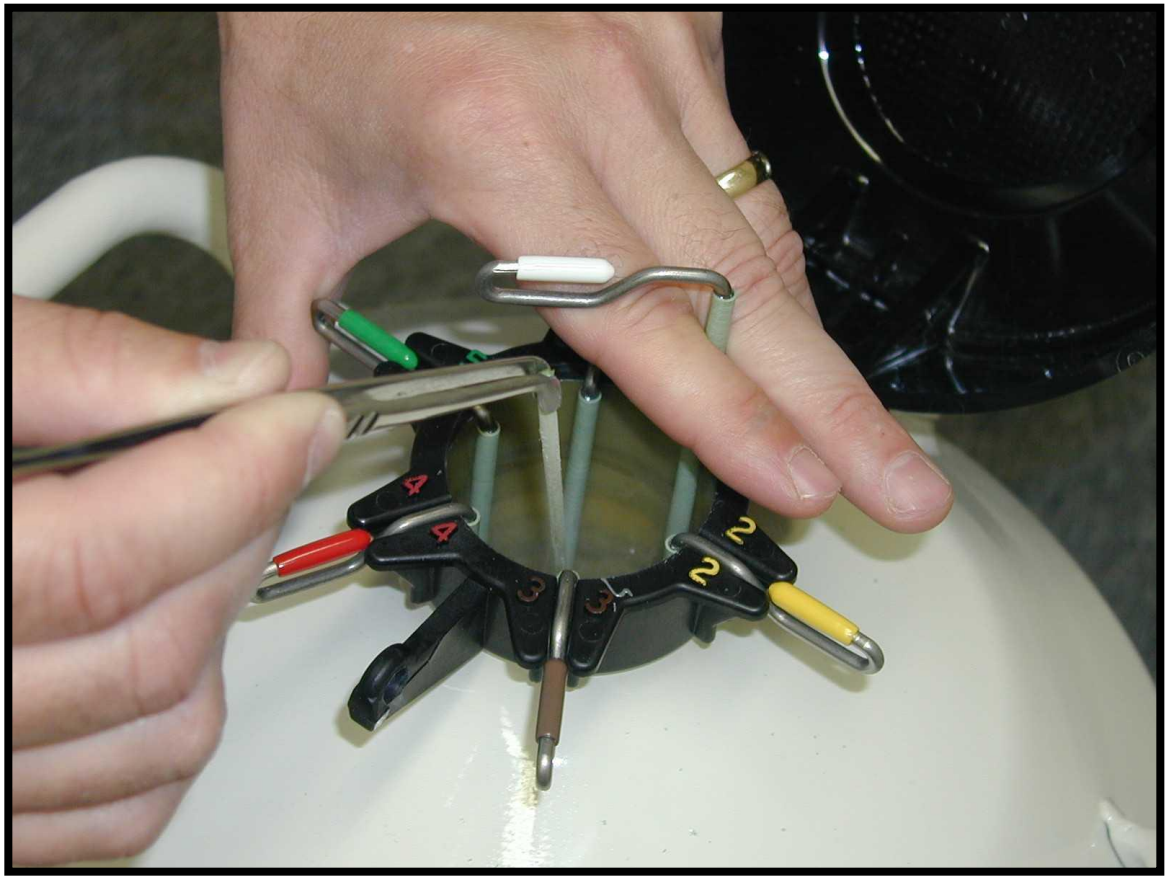
# STEP 2

- Raise rack and hold with thumb and index finger.
- Use tweezers to lift straw straight up.
- Do not bend the straw.



# STEP 3

- Using tweezers, lift the straw straight up while releasing rack back into canister and lowering canister gently back into tank.



# STEP 4

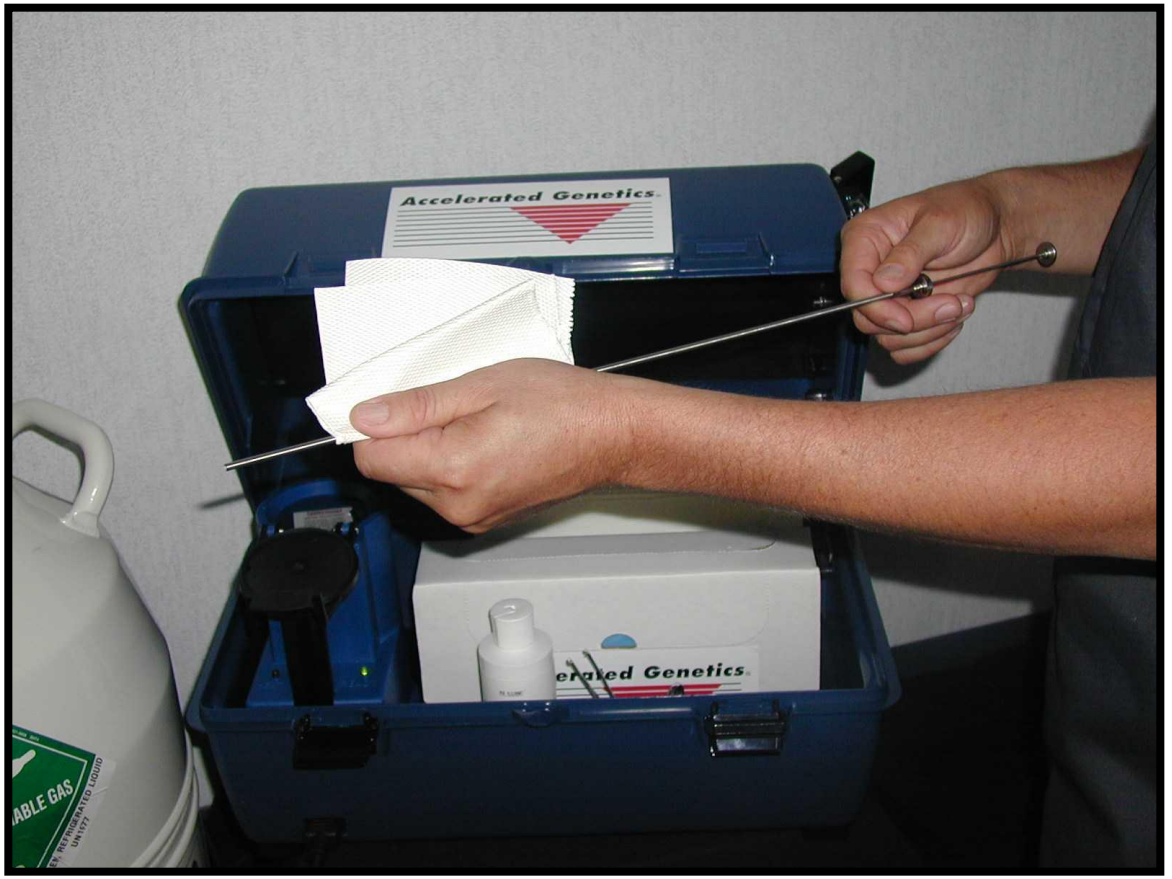
- Transfer straw immediately to thaw unit.
- Note- Temperature of water should be 95-98 ℉ or 35-37 ℃ .
- Thaw straw for at least 40 seconds but not more than 15 minutes.

# STEP 5

- Remove insemination gun from breeding kit.

# STEP 6

- Warm the insemination gun with a paper towel by using friction.



# NOTE

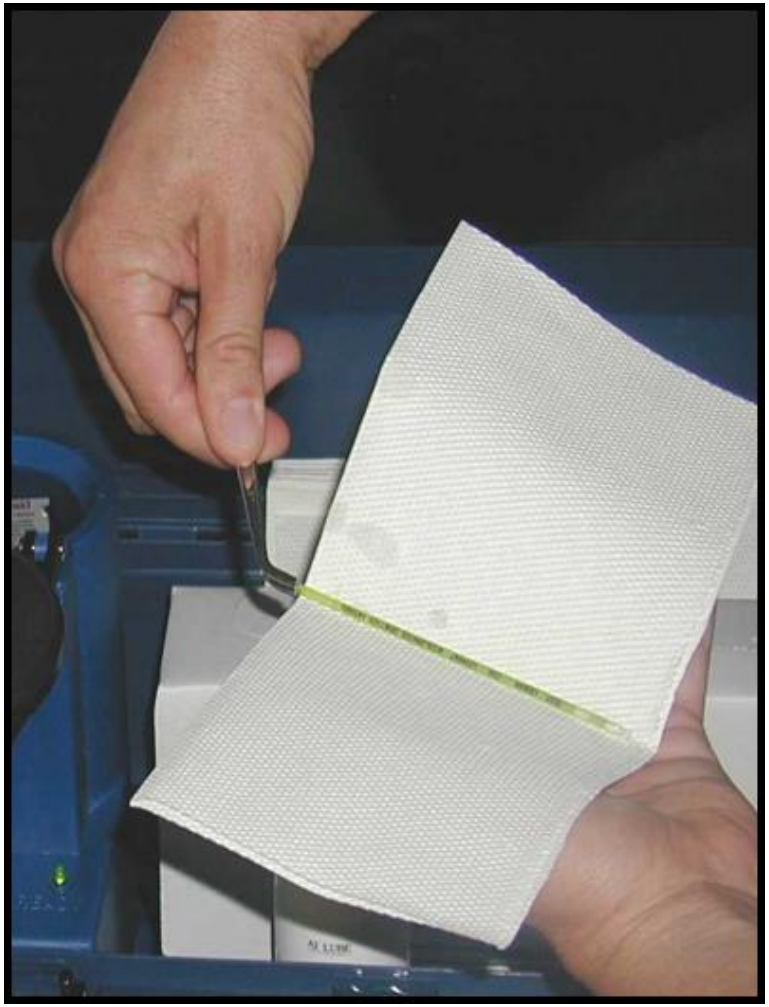
- A properly-warmed insemination gun will feel warm to the touch.
- Sperm damage will occur if placing semen straw in a cold syringe.
- Temperature of semen should always be rising up to the cows body temperature.

# STEP 7

- Store gun in a warm place.

# STEP 8

- With tweezers, remove and dry straw.
- Place in a clean paper towel.
- NOTE: Water droplets will kill sperm cells. Always use a paper towel when handling a straw.

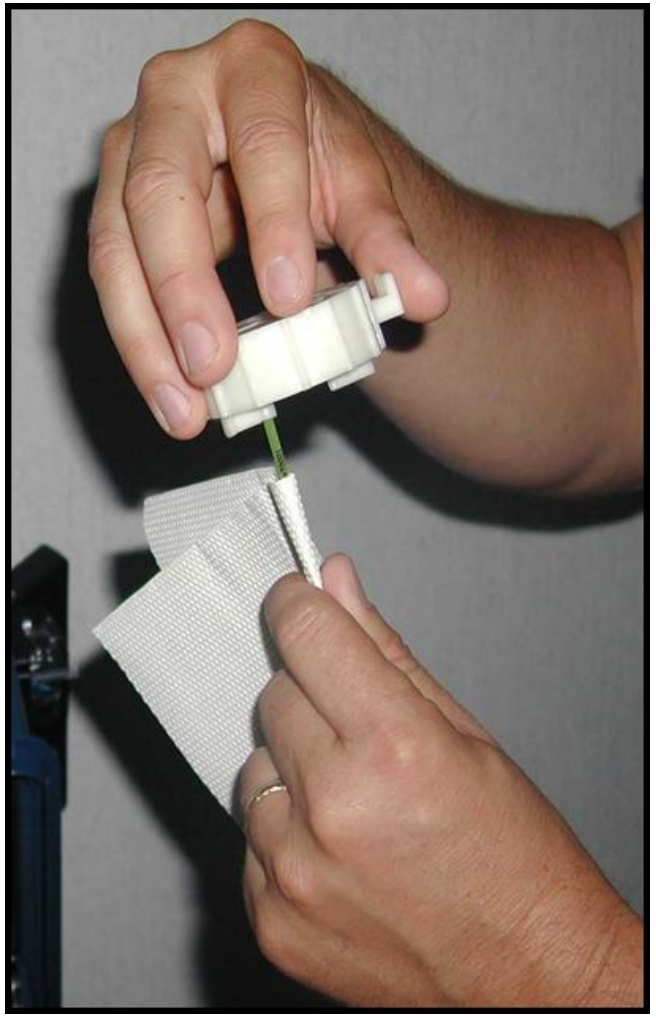


# STEP 9

- Cut off the crimped end of the straw with a scissors or Cito cutter.

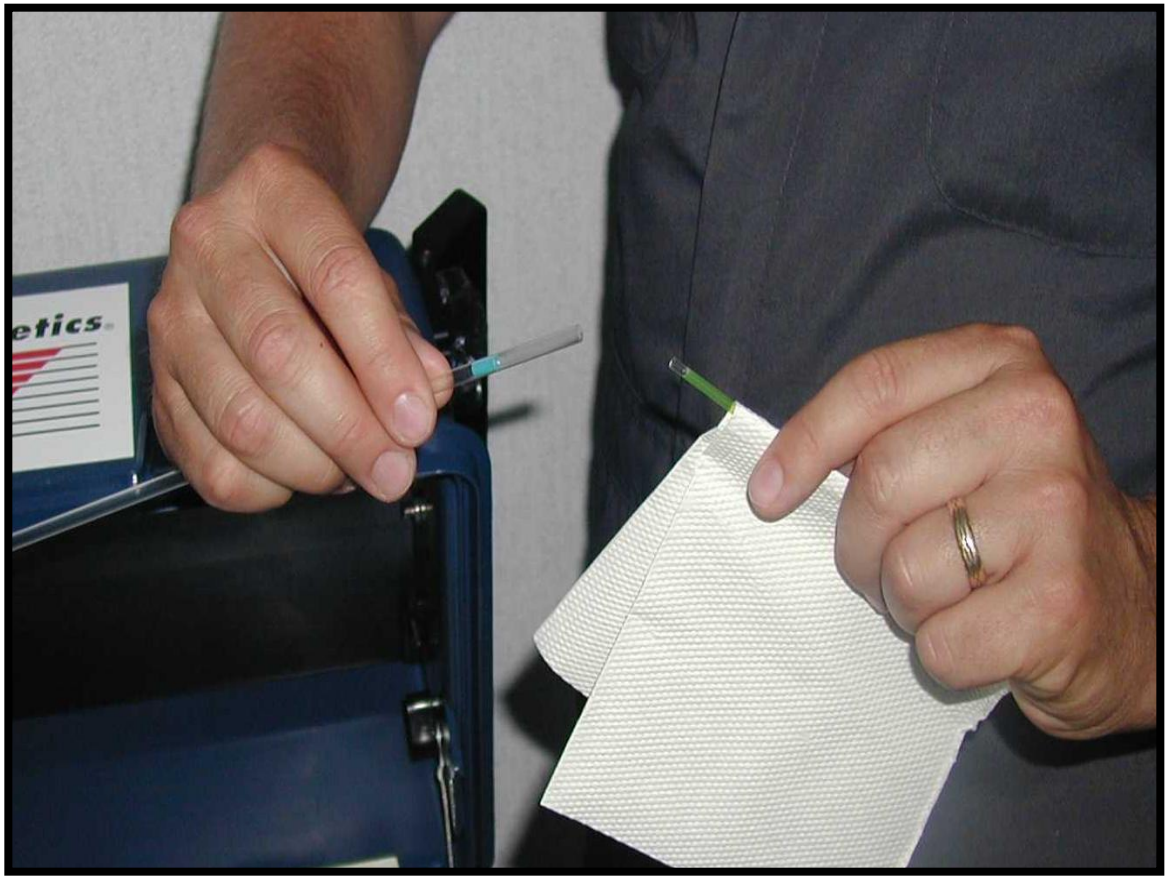
# STEP 10

- Cut the straw off 60˚ to 90˚
- NEVER cut at an acute angle (< 60˚)



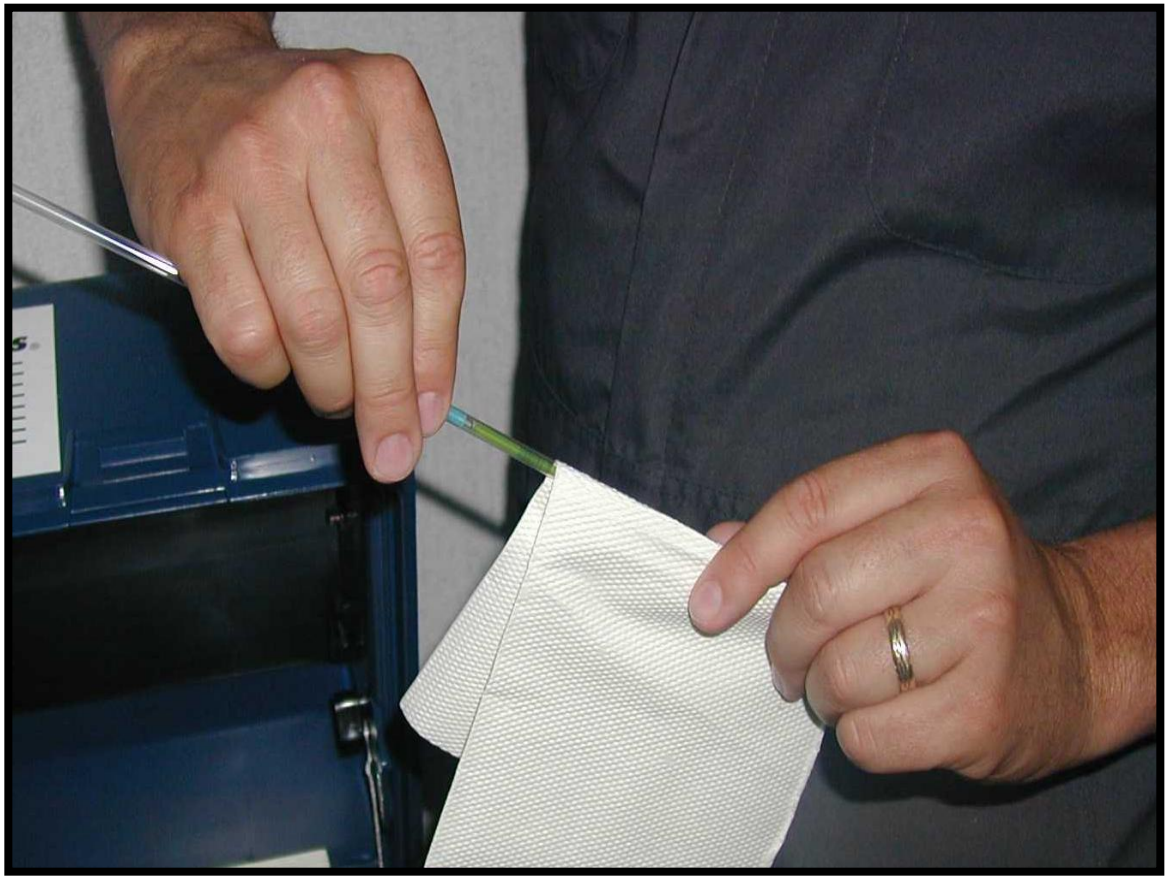
# STEP 11

- Insert the cut end of the straw into the sheath with the adapter.



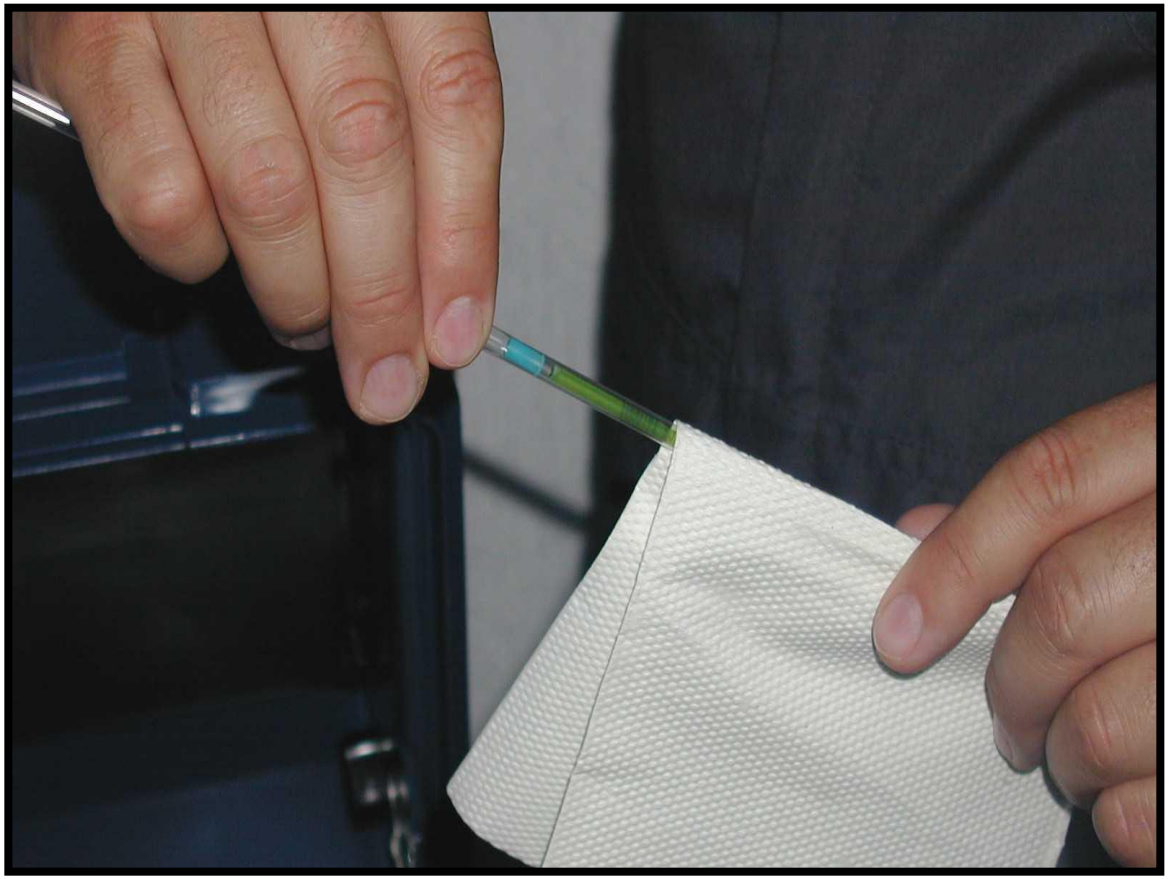
# STEP 12

- Hold the adapter in place with your thumb and finger while gently pushing the straw into the adapter.
- **NOTE -** The straw will “snap into place” do not bend the straw.



# STEP 13

- Push the straw all the way into the sheath.

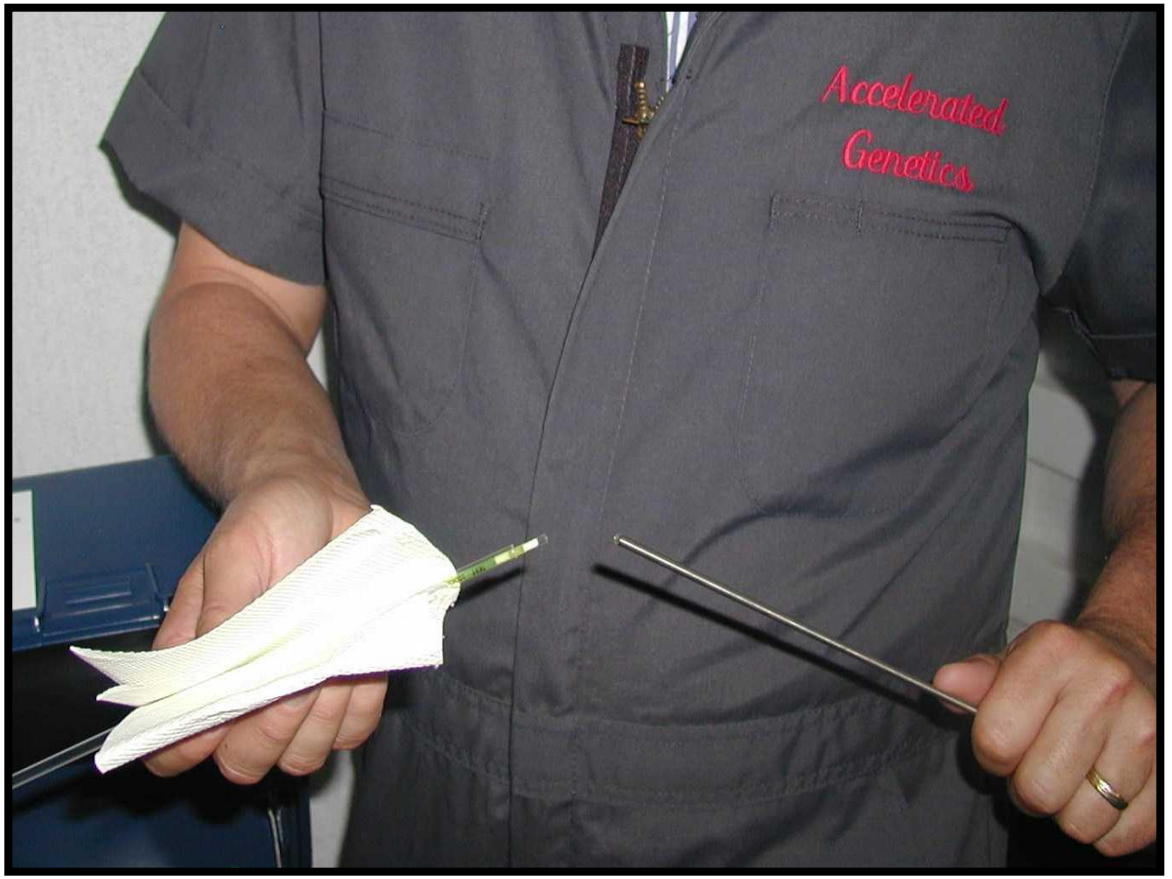


# STEP 14

- Take your insemination gun out of your coveralls and pull back the plunger about 5 inches. (This is the length of the straw).

# STEP 15

- Slide sheath with semen straw over insemination gun.



# STEP 16

- Use a twisting motion to secure sheath at base of insemination gun.

# STEP 17

Very slowly push the plunger in while watching the tip of the gun to verify that:

- Semen will freely flow, with no leaks
- Gun was properly assembled

# STEP 18

- Place insemination gun in your coverall until ready to breed the cow.

# INSEMINATING THE COW CHAPTER 7

ARTIFICIAL INSEMINATION TRAINING PROGRAM

# PLACE THE GLOVE ON THE ARM YOU WILL WORK WITHIN THE COW.

- Make sure it is stretched completely up the arm and the fingers are well filled.
- If you are right-handed place the glove on your left hand.

# APPLY LUBRICANT TO GLOVED-HAND

- Use a small amount of A.I. lubricant or K-Y jelly.
- **Note** - Never use soaps, detergents or lubricants containing disinfectants. They can irritate the rectum and are harmful to semen.

Pick up the cow's tail and move it towards the outside of the arm that will enter the cow.

With your fingers forming a cone shape, gently push your hand into the rectum.

With a paper towel, clean the vaginal opening.

# PLACE A FOLDED TOWEL JUST INSIDE THE LIPS OF THE VULVA.

This helps to eliminate contamination as the gun is inserted into the vagina.

# Insert the insemination gun into the vagina and locate target.

# WITH THE TARGET LOCATED, SLOWLY DEPRESS THE PLUNGER.

This process should take about 5 seconds.

- Do not depress plunger too fast.

After depositing semen, slowly withdraw the gun and arm.

Release the sheath containing the straw from the gun, holding it in your gloved- hand.

Peel the glove over the used sheath for easy cleanup.

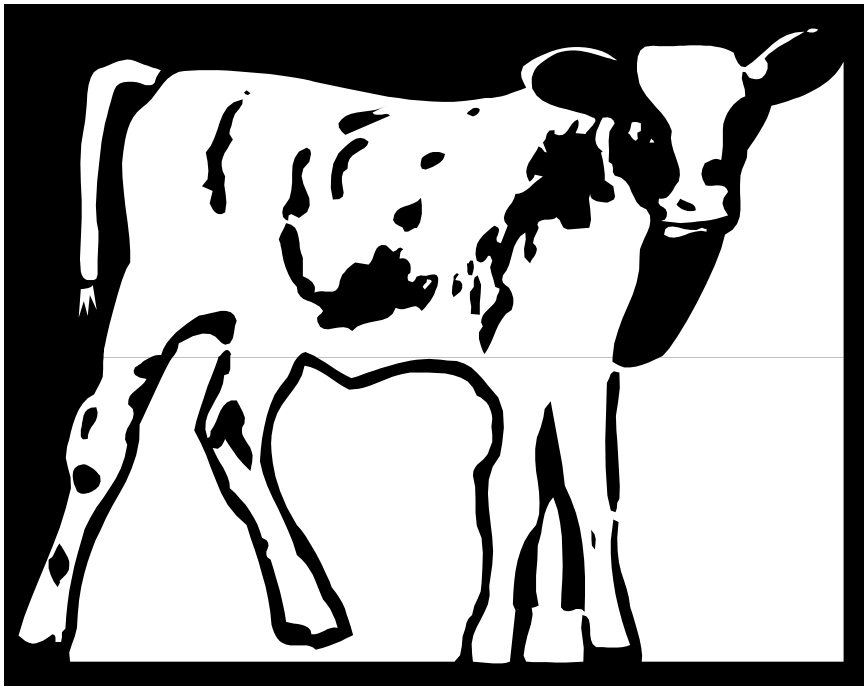
# RECORD KEEPING
# CHAPTER 8

ARTIFICIAL INSEMINATION
TRAINING PROGRAM

# RECORD ALL BREEDING INFORMATION

# RECORD DATA ON CALVES BORN

- ID of the calf
- ID of the sire
- ID of the dam
- Sex of Calf
- Date of birth



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