

# Bull Breeding Soundness Exam What's New?

Chance L. Armstrong, DVM, MS, DACT

[carmstrong@lsu.edu](mailto:carmstrong@lsu.edu)



AMERICAN COLLEGE  
OF THERIOGENOLOGISTS



# Okeechobee, FL

Ranching community

Invested in cattle

Western lifestyle



# History

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- Early 1950s Colorado
  - Rocky Mountain Society for the Study of Breeding Soundness in Bulls
    - share info, promote discovery, create standards for evaluation fertility
- Society for Theriogenology
  - American College of Theriogenologists
- SFT83 Standard
- SFT93 Standard
- 2016 Committee on Bull Breeding Soundness



# SFT BSE Task Force

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## Responsibility

- evidenced based review of the minimum BSE standards
- draft a practical guide to the BSE
  - available & valuable to entire profession

It was the consensus of the majority of the task force, that while no one felt that it was likely that sub-fertile bulls were “slipping through” a BSE performed by veterinarians following the current minimum standards, the changes recommended provide evidence based improvements of our BSE.

# Manual for Breeding Soundness Examination of Bulls

Second Edition



J H Koziol

C L Armstrong

The Society of Theriogenology

# Bull Manual 2018

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- practical
  - chute-side guide
  - vets in training
- color illustrations

Ch 1: Factors Evaluated by Observation of Breeding Behavior

Ch 2: Physical Examination

Ch 3: Examination of Scrotum and its Contents

Ch 4: Scrotal Circumference

Ch 5: Examination of the Internal Genital Organs

Ch 6: Examination of the Penis and Prepuce

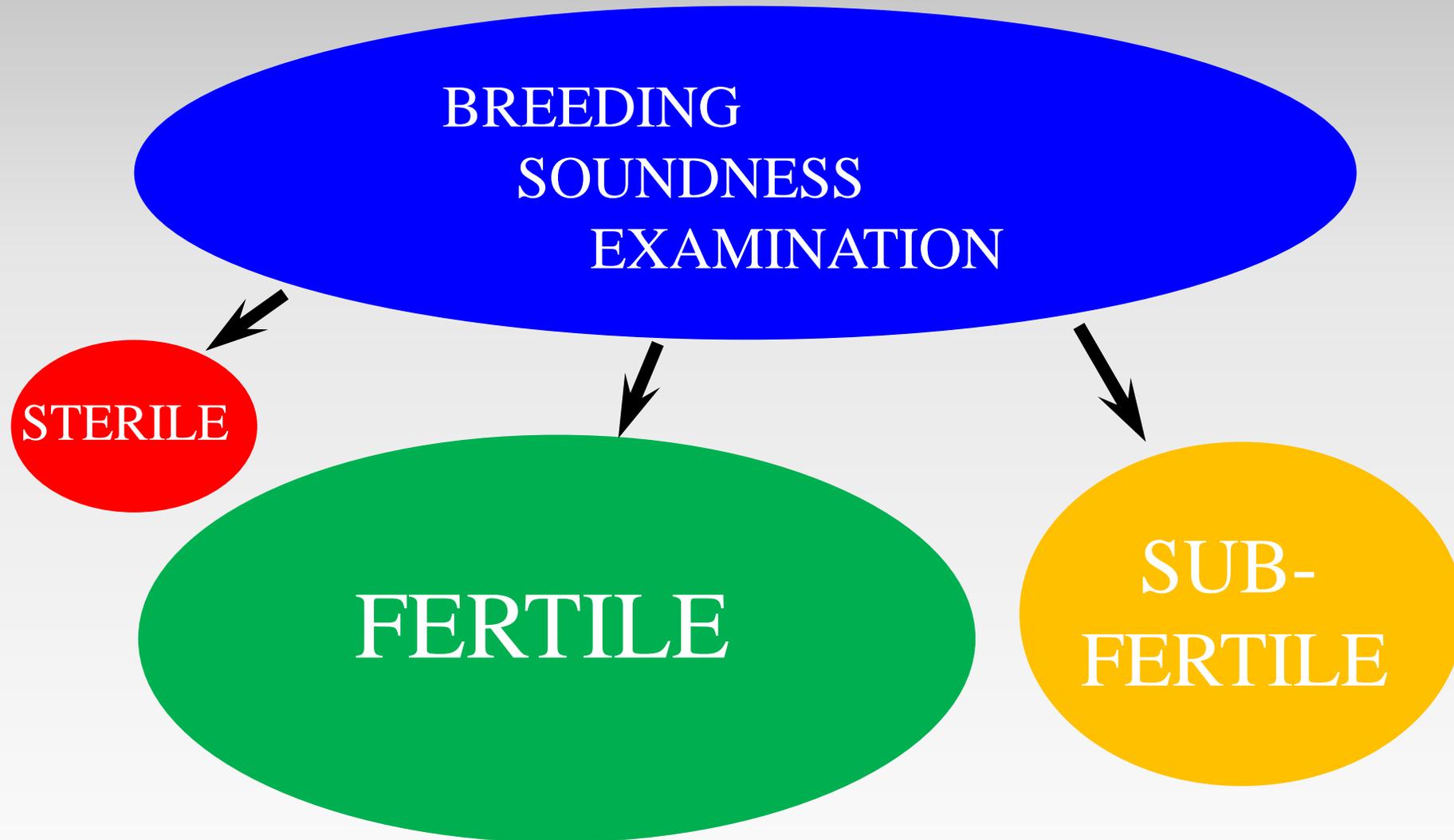
Ch 7: Semen Collection

Ch 8: Evaluation of Semen Quality

Ch 9: The Breeding Soundness Evaluation Form

Ch 10: Venereal diseases of the bull

Ch 11: Management of Beef Bulls



# Why Do We Care?

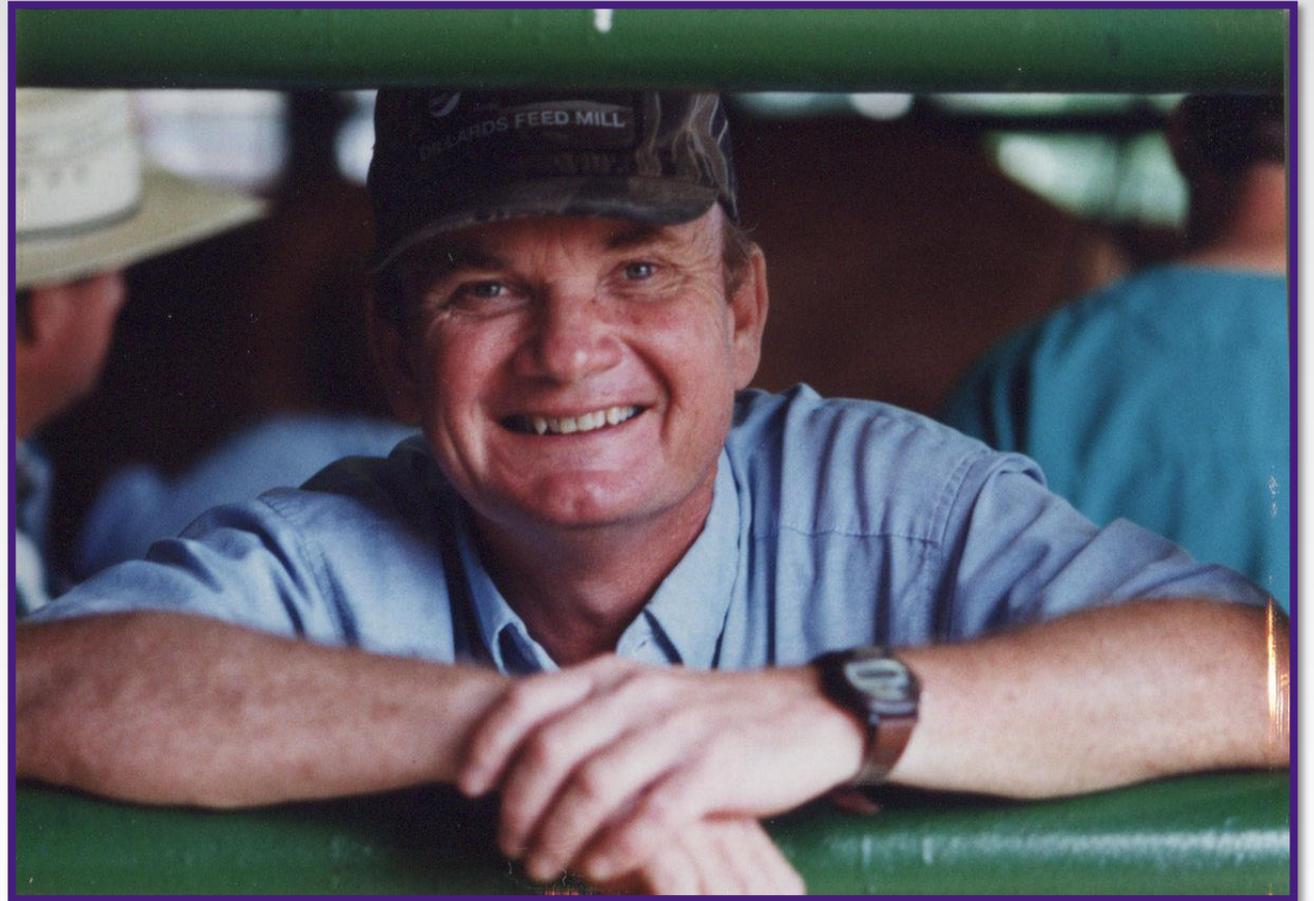
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- Economics
  - high reproductive efficiency is the most economically important factor for success in a cow-calf enterprise
  - > impact than growth rate, feed efficiency, and carcass quality
- estimated 1 out of 5 bulls sub-fertile in a unselected population due to physical unsoundness or poor semen quality
- 50-60 lb. of weaning lost per 21 day cycle

# Every Bull Every Year

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- 30-60 days prior to breeding season
- BSE is **Not** good for life
- bulls change from season to season
- certain circumstances dictate testing for venereal diseases
- cheap insurance policy
  - \$50 avg. cost/exam
- professional exam
- value added to your practice



# How do we remain relevant?



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**Society for Theriogenology**  
Veterinarians Dedicated to Animal Reproduction

### Bull Breeding Soundness Evaluation

Guidelines Established by Society for Theriogenology  
P.O. Box 3007 • Montgomery, AL 36109  
Phone 334/395-4666 • Fax 334/270-3399 • www.therio.org

OWNER		CASE NO.		DATE	
ADDRESS		BULL NAME		BREED	
ZIP		TD NO.		Brand <input type="checkbox"/> Tattoo <input type="checkbox"/> Ear Tag <input type="checkbox"/>	
TELEPHONE ( )		BIRTH DATE		AGE (MO)	
HISTORY: Previous BSE		DATE		CASE NO. CLASSIFICATION	

PHYSICAL EXAMINATION	SEMEN EXAMINATION		
Body Condition Score <input type="checkbox"/> Thin <input type="checkbox"/> Moderate <input type="checkbox"/> Good <input type="checkbox"/> Obese <input type="checkbox"/>	Collection Method: EE <input type="checkbox"/> AV <input type="checkbox"/> Massage <input type="checkbox"/>		
Beef 1, 2, 3, 4, 5, 6, 7, 8, 9 Pelvic Ht. _____ Width _____ Area _____	Response: Erection <input type="checkbox"/> Protrusion <input type="checkbox"/> Ejaculation <input type="checkbox"/>		
Dairy 1, 2, 3, 4, 5	Semen Characteristics		
Feet/Legs <input type="checkbox"/>	Ejaculate 1	Ejaculate 2	
Eyes <input type="checkbox"/>	Motility	Gross (or) Individual (%)	
Vesicular Glands <input type="checkbox"/>	% Normal Cells		
Ampullae/Prostate <input type="checkbox"/>	% Primary Abnormalities		
Inguinal Rings <input type="checkbox"/>	% Secondary Abnormalities		
Penis/Prepuce <input type="checkbox"/>	WBC, RBC, Other		
Testes/Spermatic Cord <input type="checkbox"/>			
Epididymides <input type="checkbox"/>			
Scrotum (Shape) <input type="checkbox"/>			
Other	CLASSIFICATION		
SCROTAL CIRCUMFERENCE (CM) _____	Interpretation of data resulting from this examination would indicate that on this date, this bull is a:		
This bull has been examined for physical soundness and quality of semen only. Unless otherwise noted, no diagnostic tests were undertaken for libido, mating ability or infectious disease status of this bull.	<input type="checkbox"/> Satisfactory potential breeder		
	<input type="checkbox"/> Unsatisfactory potential breeder		
Remarks and Interpretation (diagnosis, prognosis, recommendations)	<input type="checkbox"/> Clinically sound but unsatisfactory		
	Re-examination recommended on _____ DATE		
	Signed: _____		
	MEMBER-SOCIETY FOR THERIOGENOLOGY		
	Clinic: _____		



# Is the BSE worth our time??

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BSE avg. cost \$50

Professional services \$150/hr

Labor costs \$10/hr

8 exams/hour

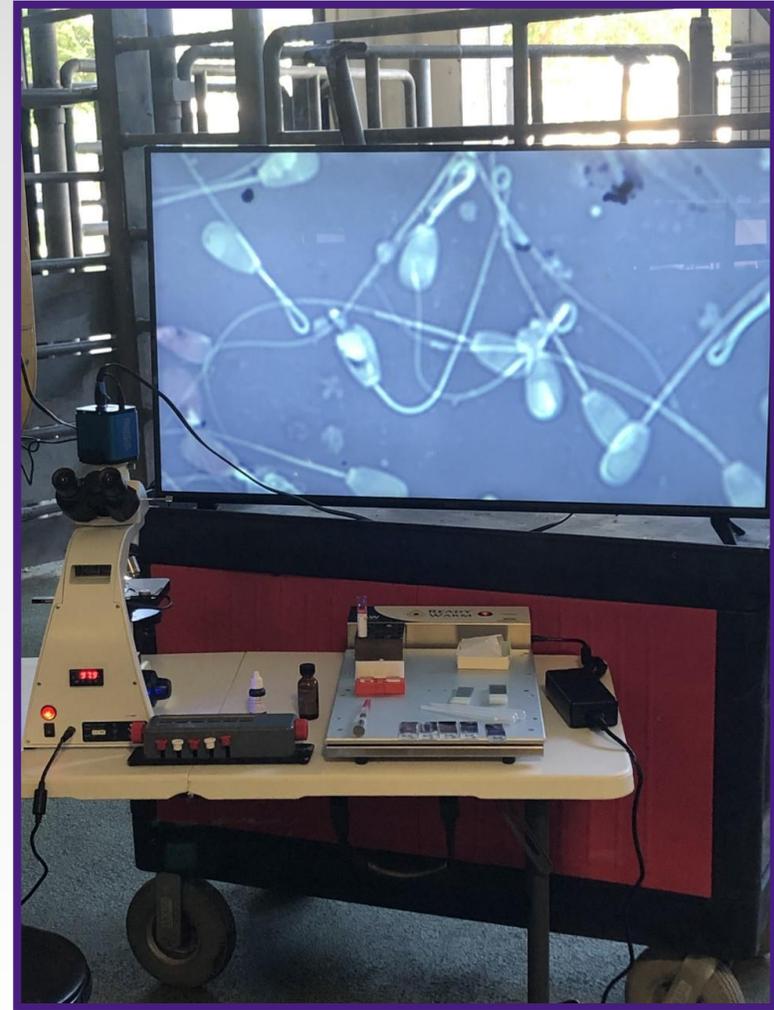
$8 \times \$50 = \$400/\text{hour}$

$\$400/\text{hr} - \$20 = \$380/\text{hr}$

# How do you build volume?

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- BSE Day at the clinic
  - discounted services
  
- seeing is believing!
  - imaging systems
  - quality microscope



How clean is your  
scope?

What quality scope  
do you have?



# 1993 SFT BSE Criteria

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## Parts

- Physical Exam
- Scrotal Circumference
- Progressive Motility
- Morphology

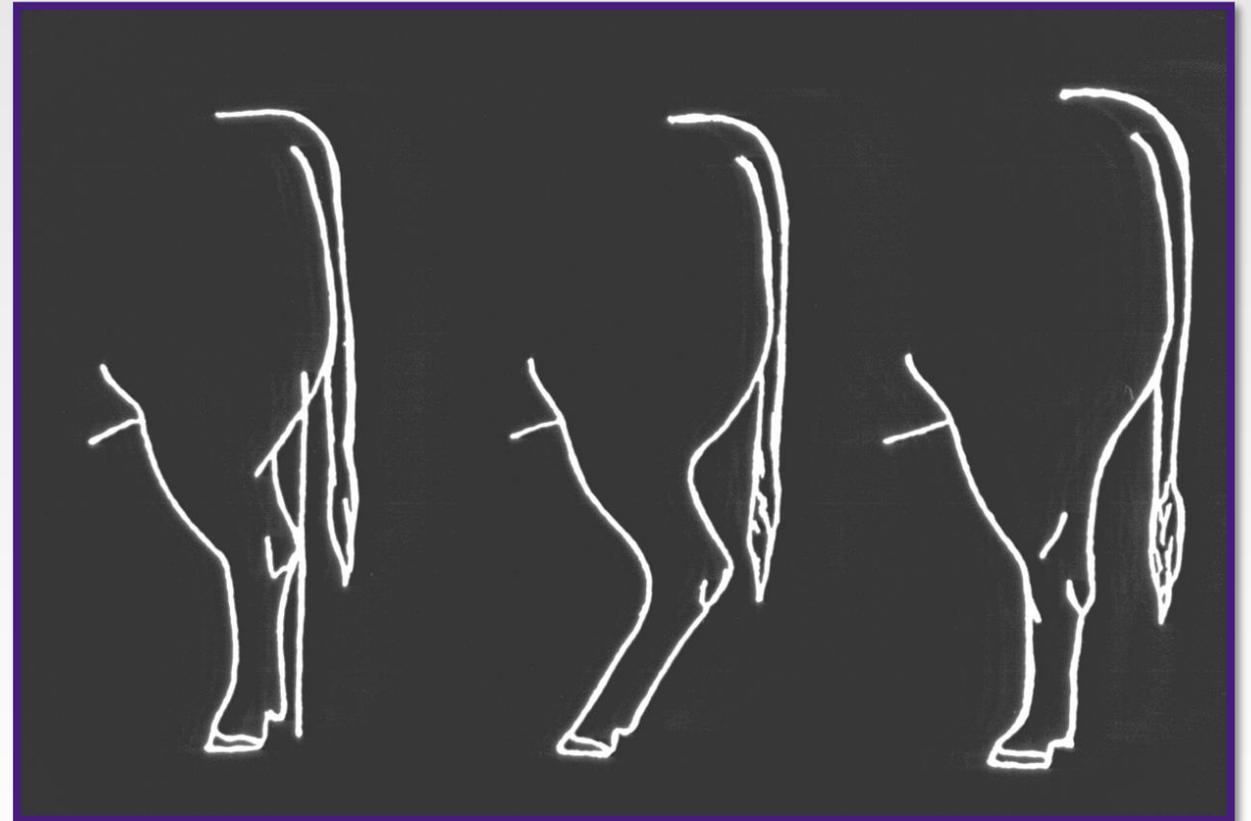
**All Equal & Cumulative**

# 1993 SFT BSE Criteria

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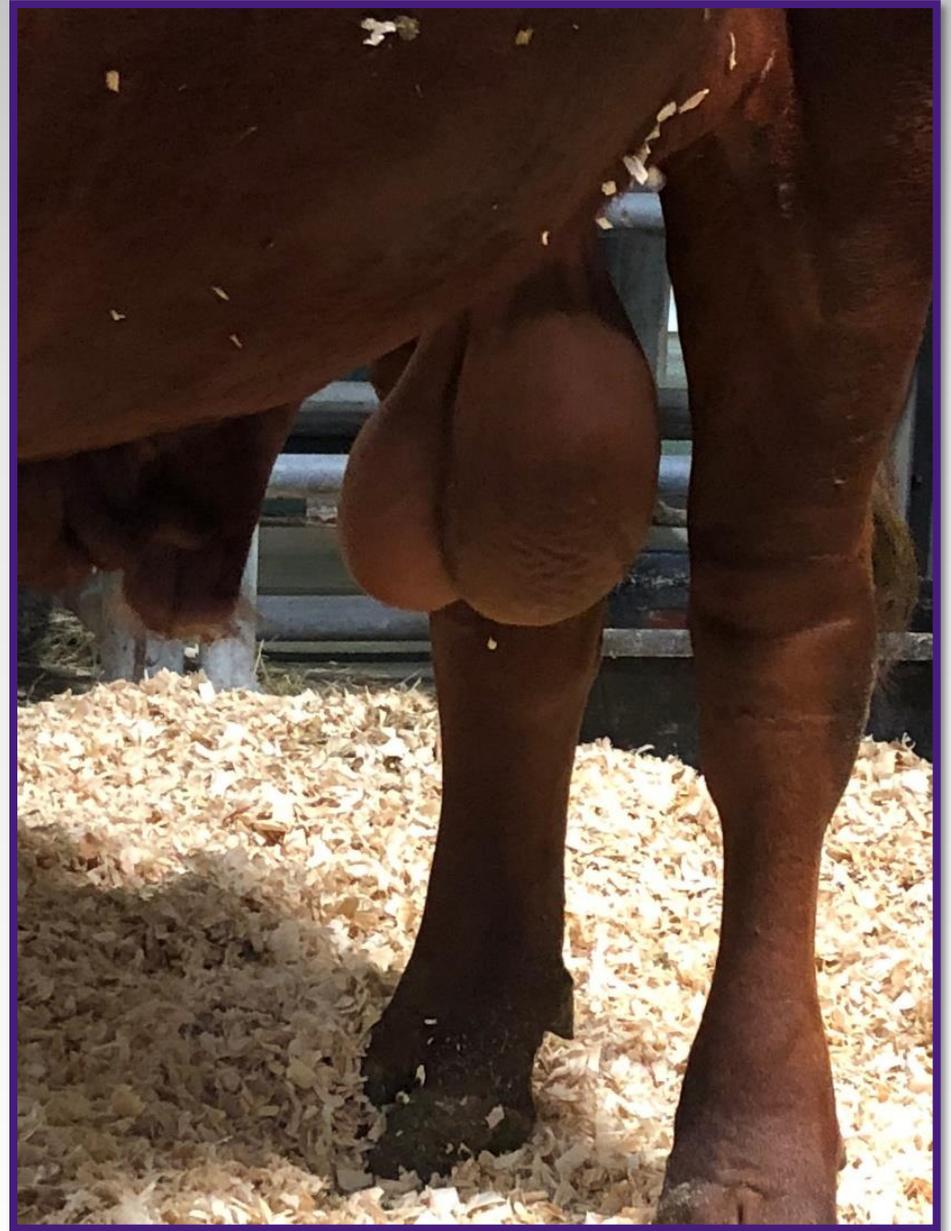
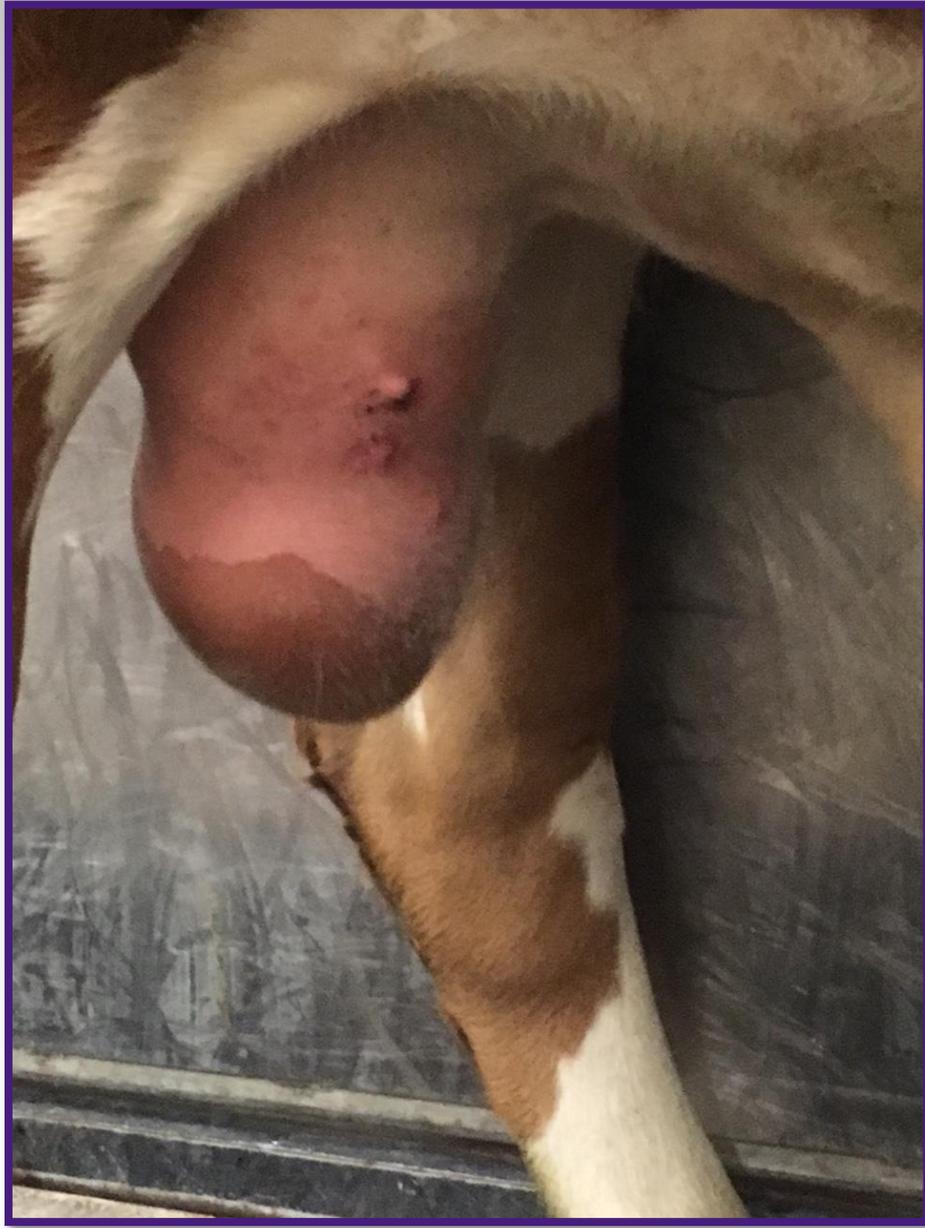
## Physically Sound

- move with ease
- detect female in estrus
- mount & complete breeding
- free of heritable defects

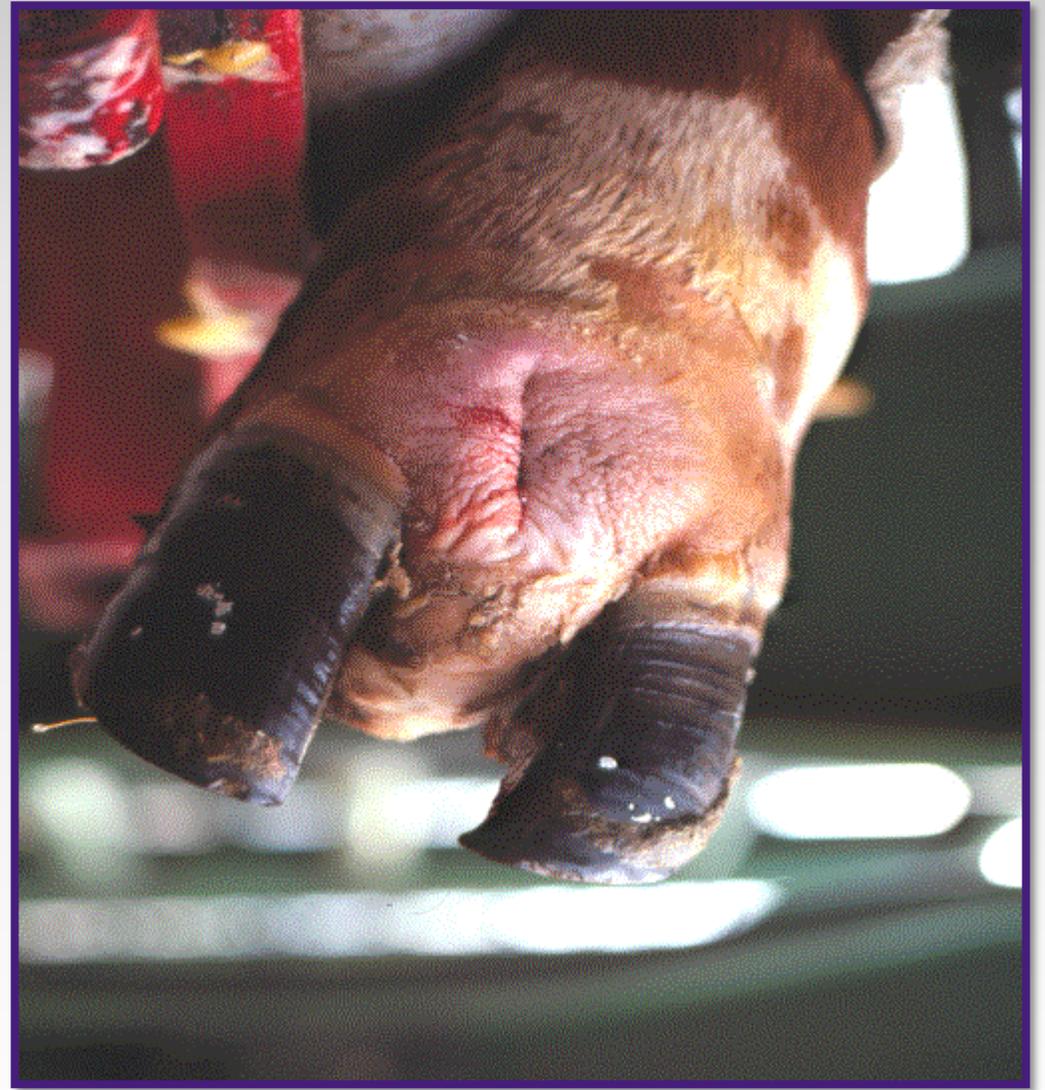








# Physical Exam



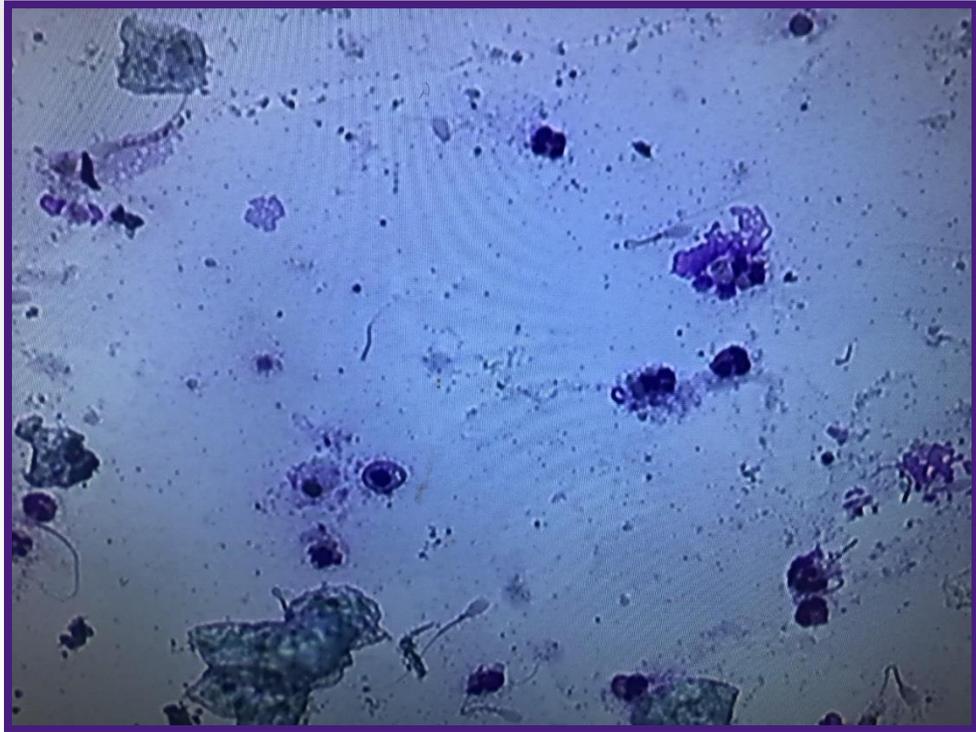
# Physical Exam



# Rectal Exam

Vesicular Adenitis

Urethralis m.



# Physical Exam



# Scrotal Circumference

Measure in centimeters

Scrotal circumference and semen production are highly correlated

AGE	SC (cm)
$\leq 15$ months	30
$> 15 \leq 18$ months	31
$> 18 \leq 21$ months	32
$> 21 \leq 24$ months	33
$> 24$ months	34

# Scrotal Circumference

Lifetime potential testis size is determined before weaning



Nutritional level post-weaning period has minimal effect on the potential scrotal size of yearling and older bulls

Barth et al. Theriogenology 2008





# 1993 SFT BSE Criteria

## Semen Quality

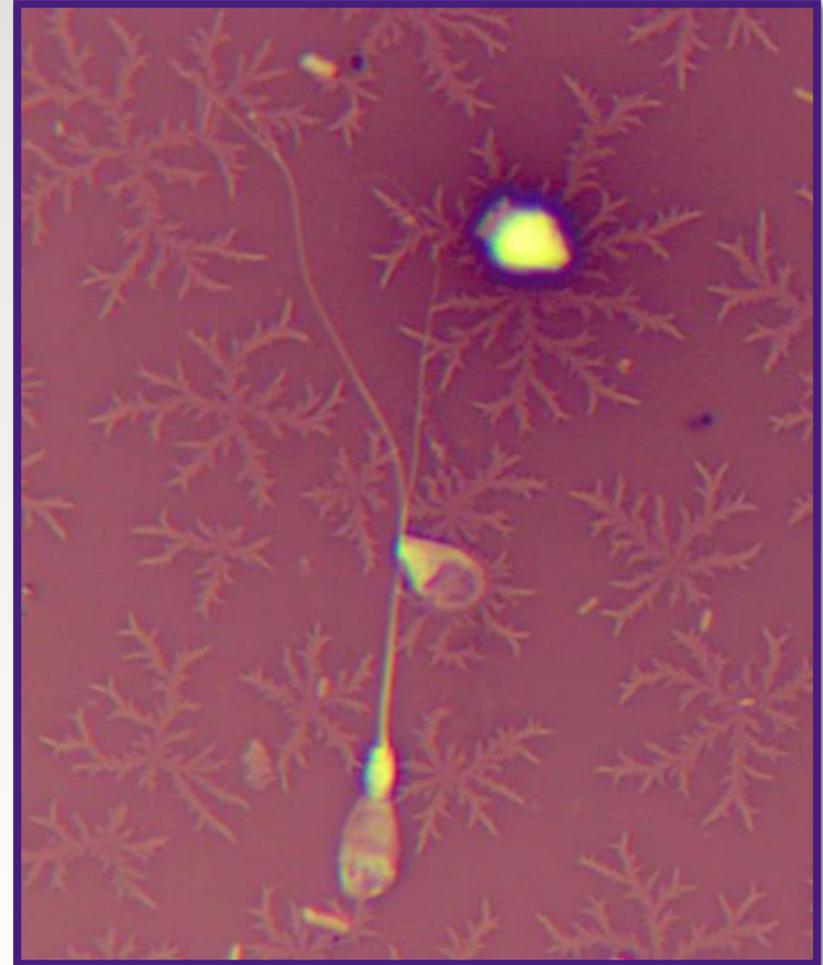
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### Progressive Motility

- minimum 30% motile

### Morphology

- minimum 70% normal
  - primary & secondary abnormalities
  - 20% maximum 1° abnormalities of total



# Sample Collection

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## Electroejaculation

- manual stimulation of urethralis muscle

Extension provides clean sample & exam of penis/prepuce

## Control of environmental temperature

- water jacket, styrofoam cup

3-5 minute from collection till slide prep





# Collection Problems?



# Bull Straps



# Collection Problems?





# Slide Warmer Alternatives

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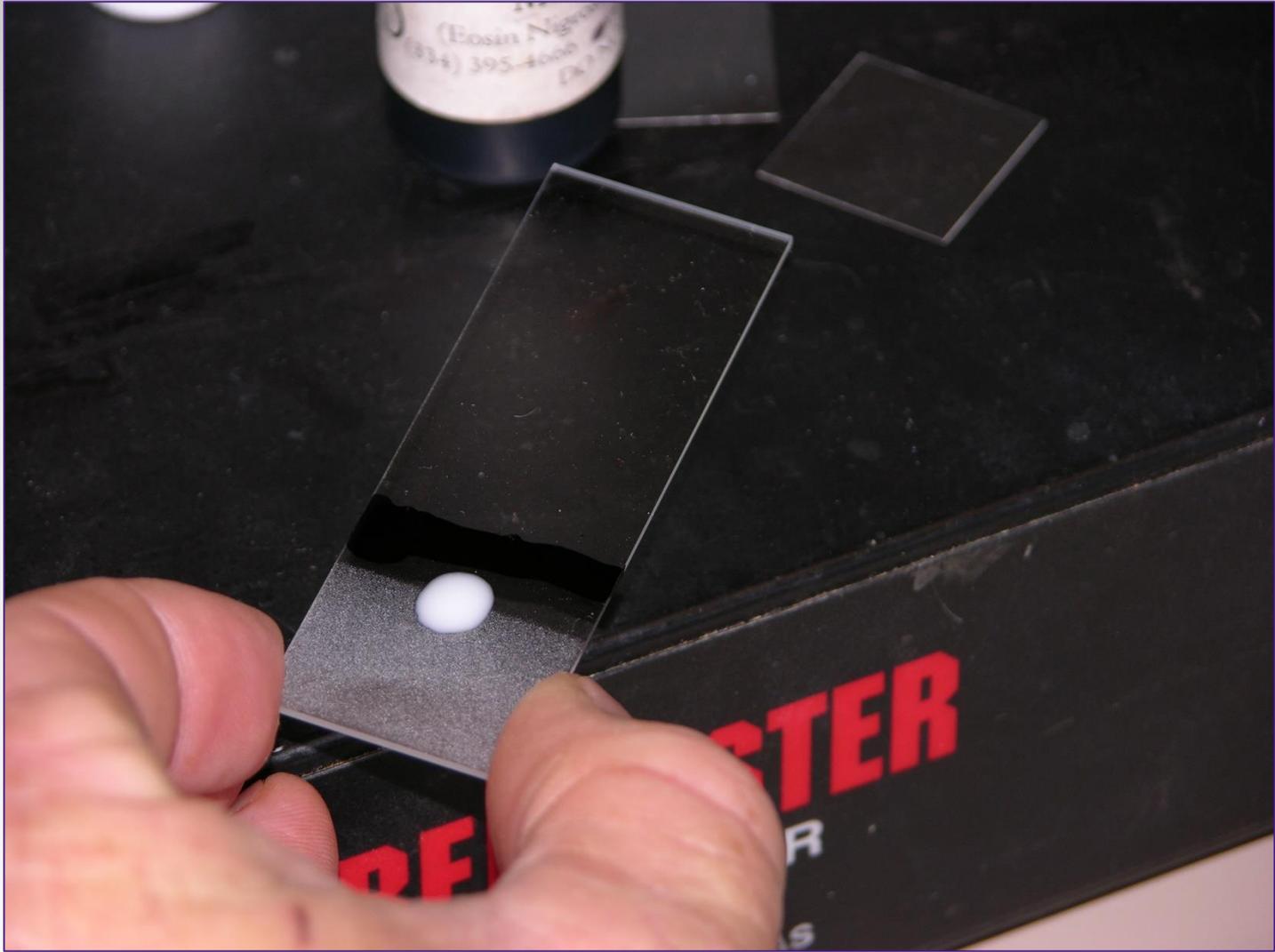
K&H Pet Products Deluxe Lectro-Kennel Heated Pad

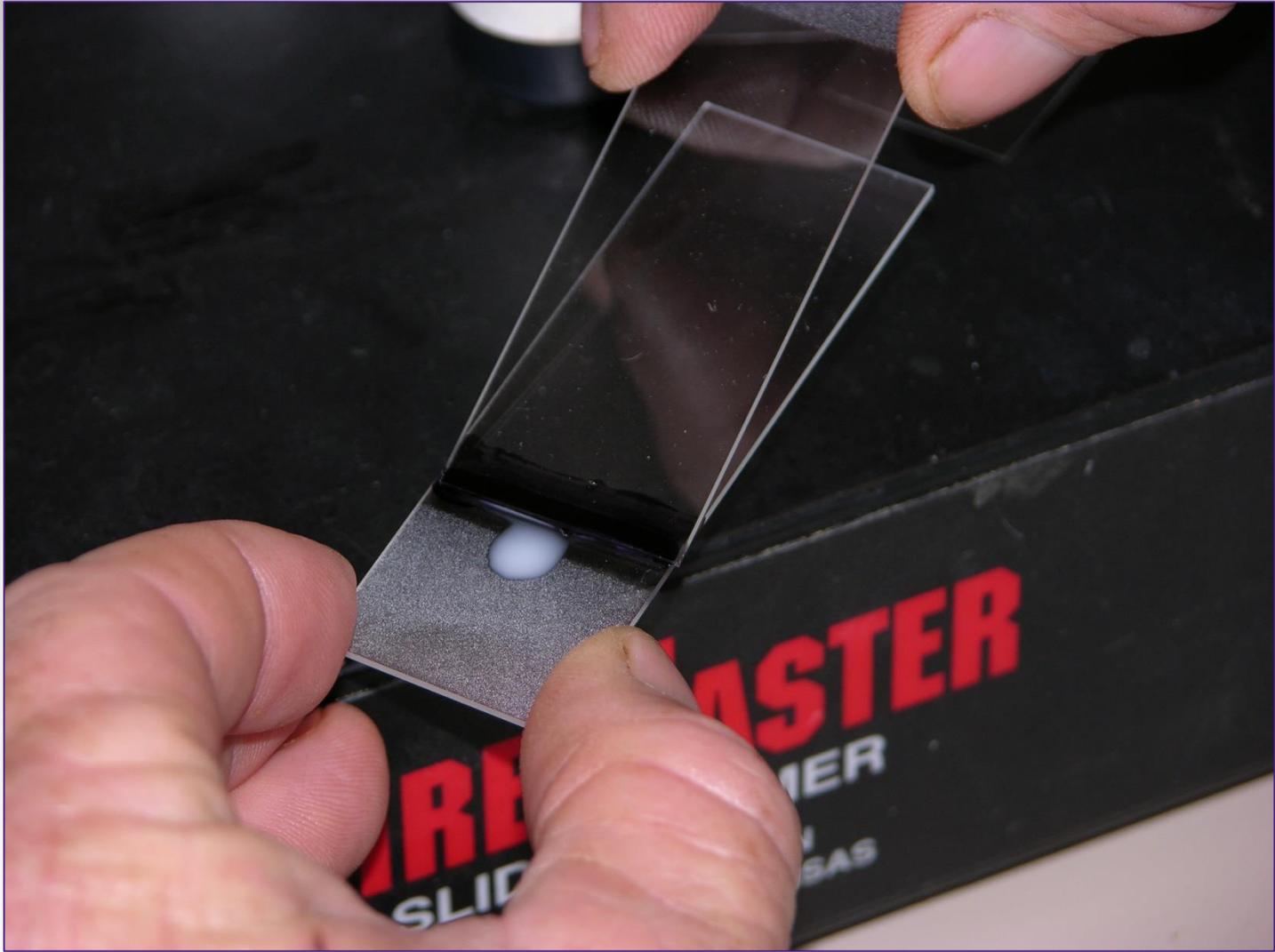
# Slide Preparation

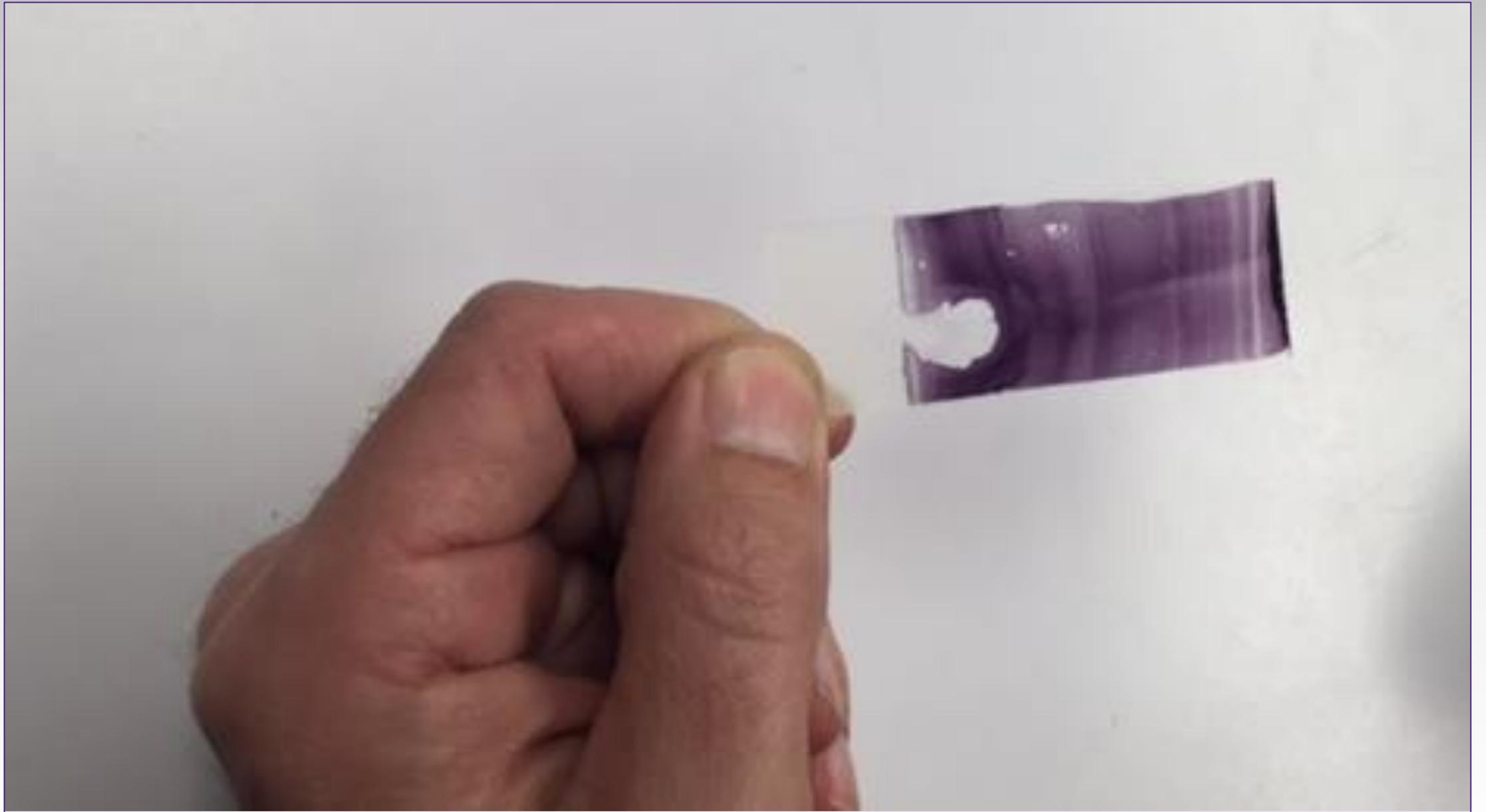


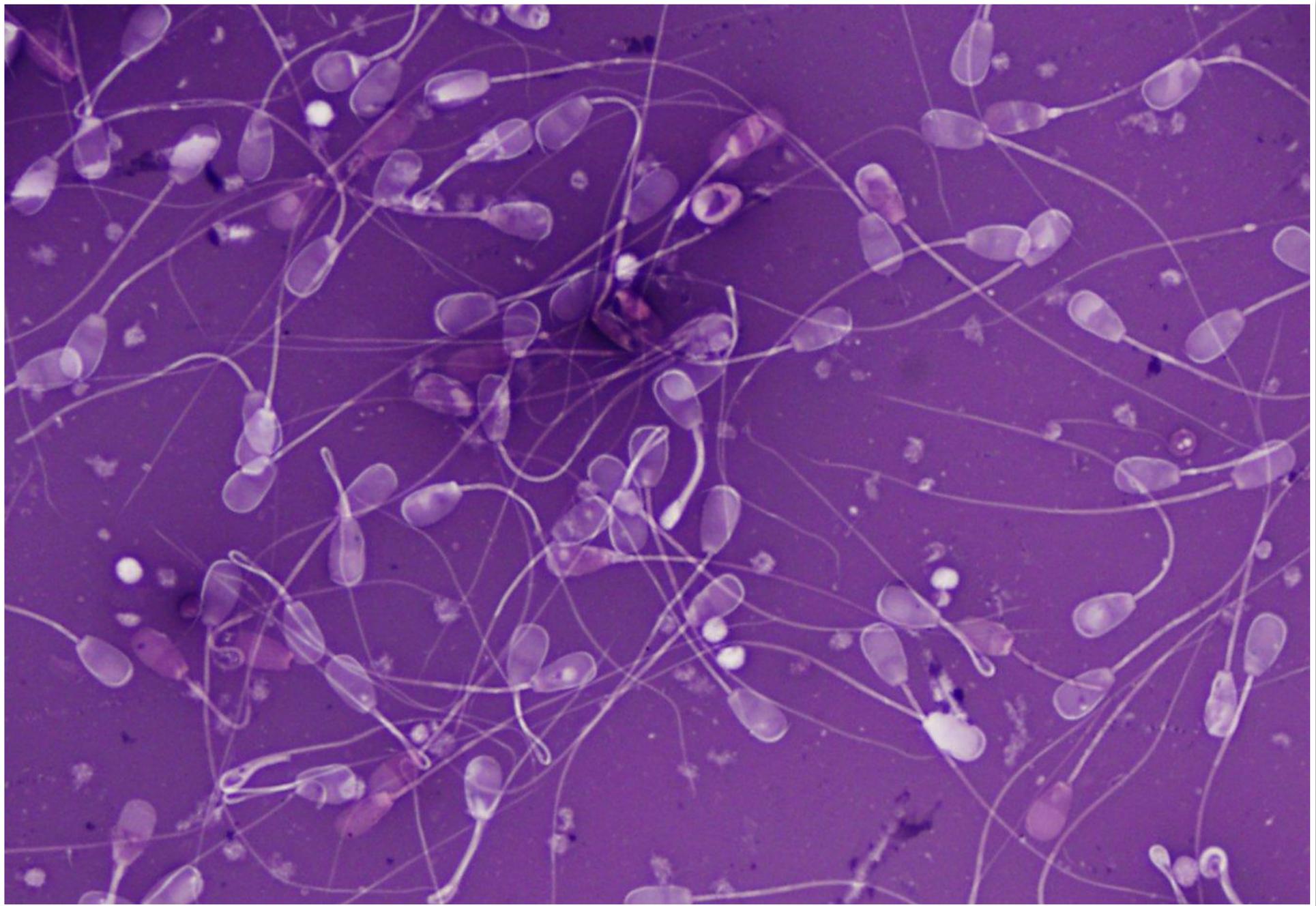






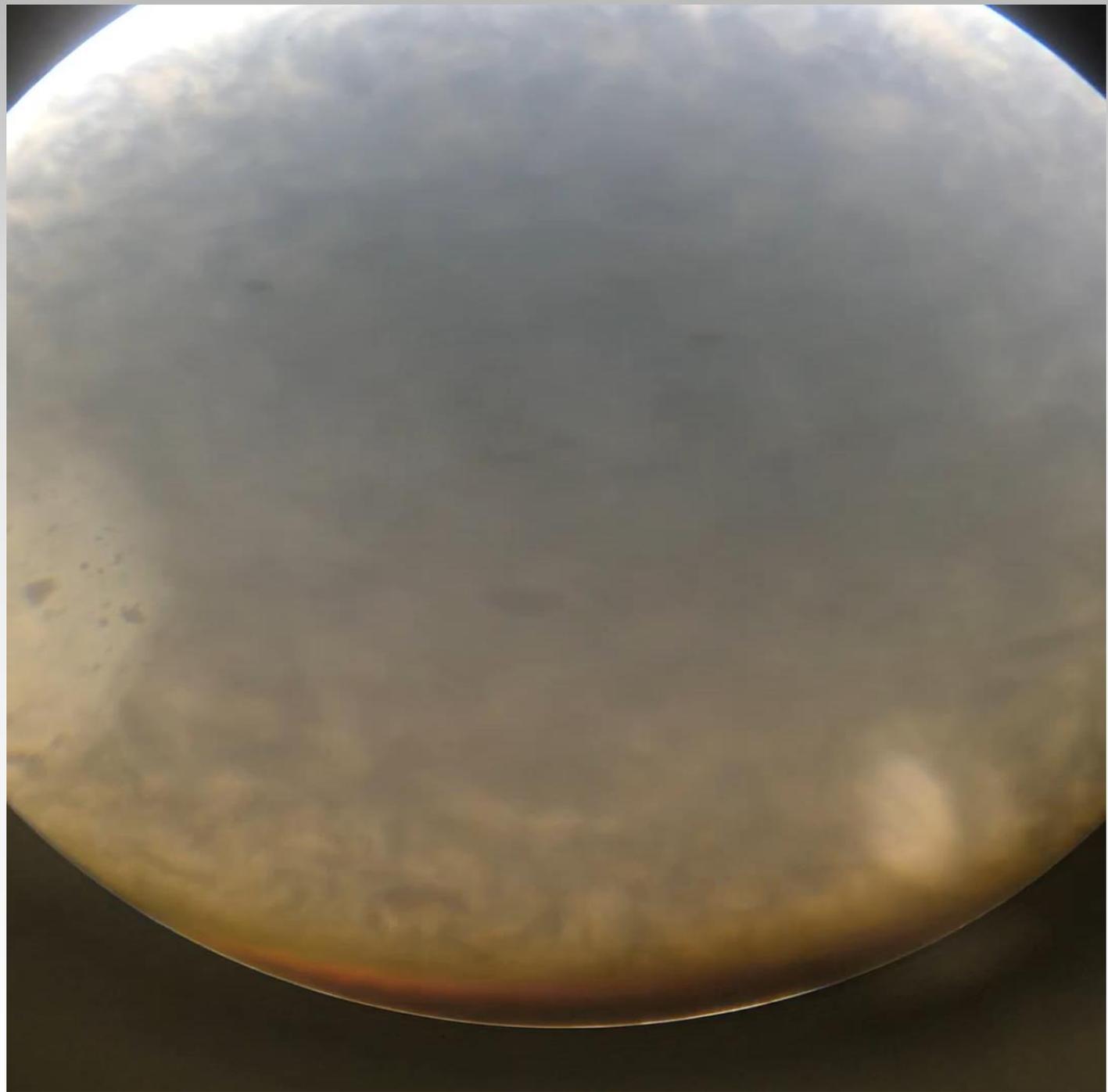






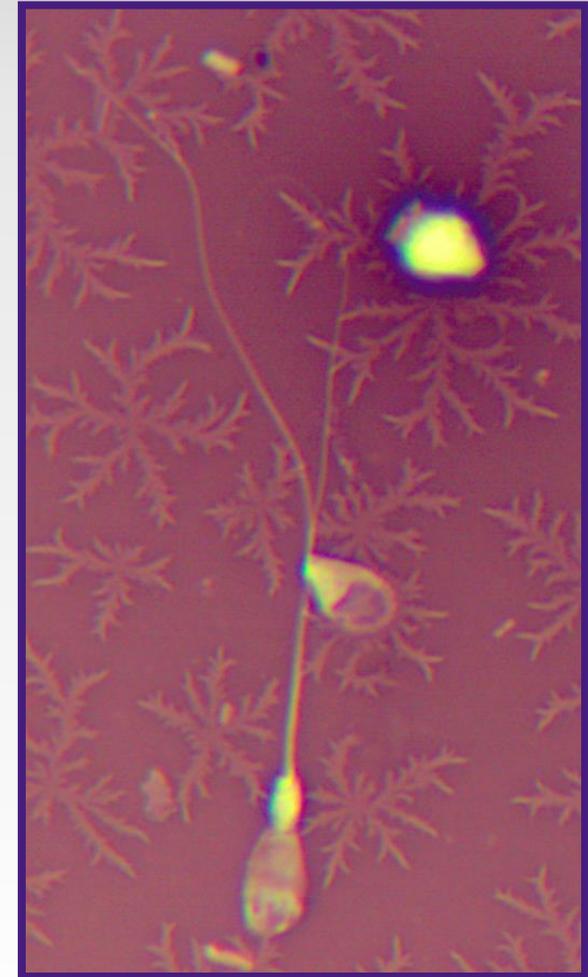


Magnification: 100 x



**Twenty year trends of bull breeding soundness examinations at a teaching hospital**  
Robert Carson, Jennifer Koziol, James Wenzel, Chance Armstrong, Jason Edmondson, Herris Maxwell  
College of Veterinary Medicine, Auburn University, Auburn, AL

- **unacceptable morphology** was by far the most common reason for unsatisfactory or deferred classification over all time periods.
- validation that “**wiggle test**” is unacceptable for discovering sub-fertile bull populations.



# Abnormal Sperm Morphology

- Insults to spermatogenesis
  - genetics
  - toxins
  - nutritional
  - infectious diseases
  - **heat**
  - **stress**



# Morphologic Abnormalities

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## HEAT

- Thermoregulation
  - 4-5° C cooler than core body temp
  - pampiniform plexus
  - scrotal fat
  - fluid around testicle
  - scars, frost-bite
- apoptosis of germ cells
  - pachytene spermatocytes, spermatids and epididymal sperm

## STRESS

- illness, pain, hunger, inclement weather
- suppression of LH & FSH
  - decreased testosterone by leydig cells
  - sertoli cell function T dependent
- 3-4 days duration to cause effect

% of normal sperm lowest 3 weeks post heat/stressor

Pre-treatment levels by 6 weeks post insult Barth et al 1994

# Recommended Changes to Spermogram

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## Motility

- no changes in minimum requirement

## Morphology

- changes in classification scheme
  - 1°, 2° ➡ head, mid-piece, tail
  - 70% normal
- abaxial tail implantation
- distal cytoplasmic droplet



# Progressive Motility

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## Evaluation

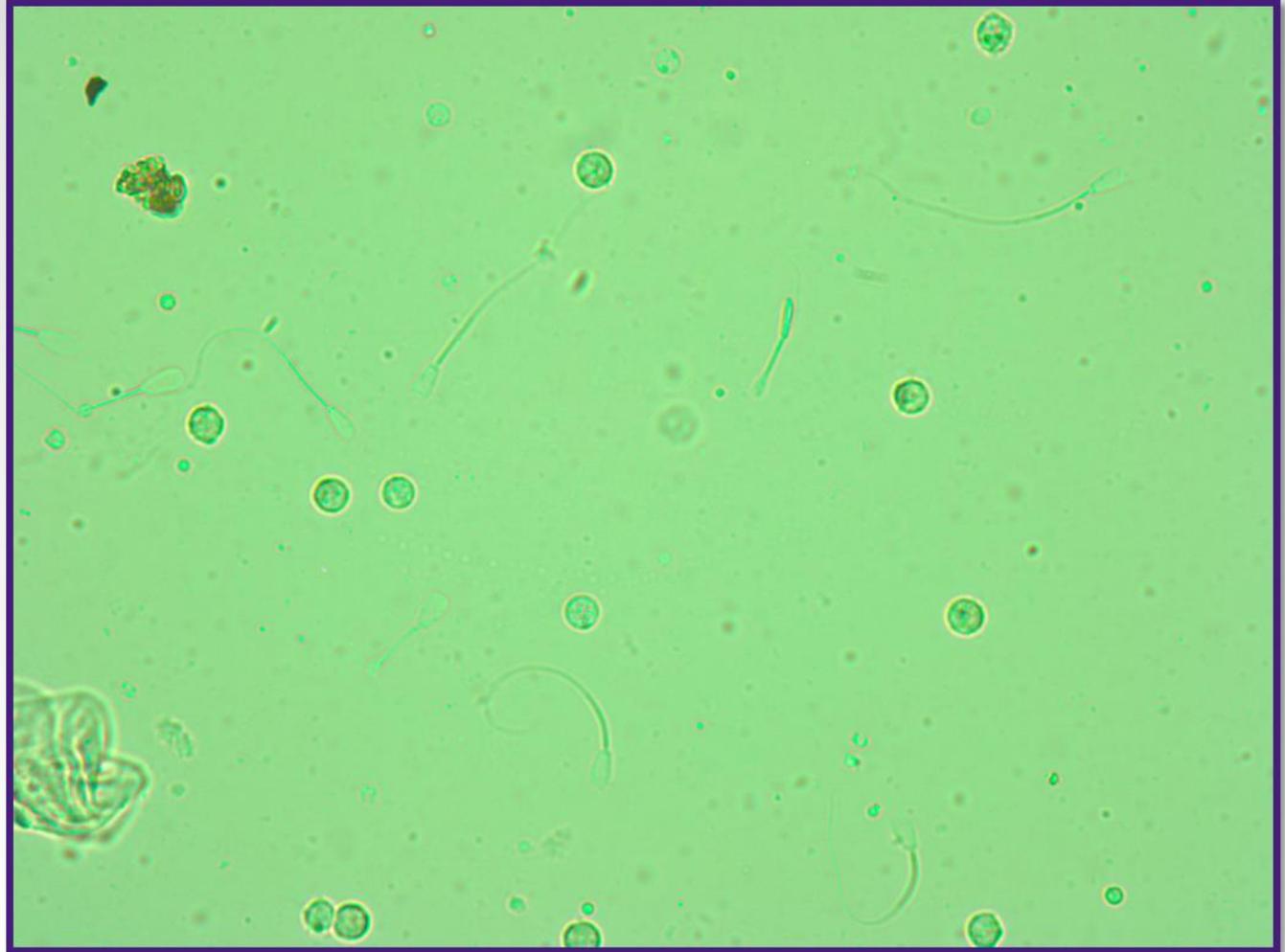
- 400 X
- dilute w/ warm saline
- > or < 50%
- minimum 30% motile



# Progressive Motility

## Spheroids

- immaturity
- regeneration
- degeneration



# New Classification Scheme

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- allows for differential counting & grouping of defects
  - normal
  - head
  - mid-piece
  - tail

**minimum of 70% morphologically normal spermatozoa  
< 20% head or mid-piece abnormalities**

# New Normal Classification

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**ABAXIAL TAIL IMPLANTATION**



**DISTAL CYTOPLASMIC DROPLET**



# Abaxial Tail Implantation

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- reported as a normal feature in other species (stallion, dog, boar)
- retrospective study found sperm w/ abaxial tail attachment fertilize ova at a normal rate

Barth AD. Abaxial tail attachment of bovine spermatozoa and its effect on fertility. Can Vet J 1989

- bulls producing sperm with abaxial tails generally have:
  - grossly normal testicles
  - semen of normal density
  - progressive motility with good post-thaw viability following cryopreservation

# Distal Cytoplasmic Droplet

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- cytoplasmic droplets just proximal to the annulus
- normally shed as cells are mixed w/seminal fluid and motility ensues as membrane stretches
  - much of cellular debris on spermiogram
- sperm aberration does not appear to originate in the testis or epididymis
- SFT93 standards
  - 2° abnormality
- semen with a high % of distal droplets is incubated for 15-30 minutes or agitated
  - the droplets are found to be released and dropped from the spermatozoa

Barth AD 2013
- Swedish study showed no adverse effects in bull with high % (Al-Makhzoomi A et al 2008)

# Limitations

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- snap shot in time
- no reliable chute side assessment of:
  - libido
  - mating ability
- does NOT guarantee that a bull is highly fertile
- does NOT rank bulls with respect to fertility
- does NOT ensure bulls are free of infectious agents in their semen

# 2019 SFT BSE Form

SEMEN EXAMINATION		
Collection Method EE <input type="checkbox"/> AV <input type="checkbox"/> Massage <input type="checkbox"/>		
Response: Erection <input type="checkbox"/> Protrusion <input type="checkbox"/> Ejaculation <input type="checkbox"/>		
Semen Characteristics	Ejaculate 1	Ejaculate 2
Motility Adequate (Y-N)		
% Normal Cells		
% Head Abnormalities		
% Midpiece Abnormalities		
% Tail Abnormalities		
WBC, RBC, Spheroids, Other		



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 Bull Breeding Soundness Evaluation  
 Guidelines Established by Society For Theriogenology  
 Phone 334/395-4666 • Fax 334/270-3399 • www.therio.org

Bull ID or Lot #
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OWNER	CASE NO.	DATE
ADDRESS	BULL NAME	BREED
ZIP	I.D. NO.	Breid <input type="checkbox"/> Tattoo <input type="checkbox"/> Ear Tag <input type="checkbox"/>
TELEPHONE ( )	BIRTH DATE	AGE (MO.)
HISTORY: Previous BSE	DATE	CASE NO.
		CLASSIFICATION
PHYSICAL EXAMINATION		SEMEN EXAMINATION
Body Condition Score ____ Thin <input type="checkbox"/> Moderate <input type="checkbox"/> Good <input type="checkbox"/> Obese <input type="checkbox"/> Beef 1,2,3,4,5,6,7,8,9 Dairy 1,2,3,4,5		Collection Method EE <input type="checkbox"/> AV <input type="checkbox"/> Massage <input type="checkbox"/> Response: Erection <input type="checkbox"/> Protrusion <input type="checkbox"/> Ejaculation <input type="checkbox"/>
Feet/Legs <input type="checkbox"/>	Eyes <input type="checkbox"/>	Semen Characteristics
Vesicular Glands <input type="checkbox"/>	Vaginal Rings <input type="checkbox"/>	Ejaculate 1
Ampullae/Prostate <input type="checkbox"/>	Penis/Prepuce <input type="checkbox"/>	Ejaculate 2
Inguinal Rings <input type="checkbox"/>	Testes/Spermatic Cord <input type="checkbox"/>	Motility Adequate (Y-N)
Peris/Prepuce <input type="checkbox"/>	Epididymides <input type="checkbox"/>	% Normal Cells
Testes/Spermatic Cord <input type="checkbox"/>	Scrotum (Shape) <input type="checkbox"/>	% Head Abnormalities
Epididymides <input type="checkbox"/>	Other	% Midpiece Abnormalities
Scrotum (Shape) <input type="checkbox"/>	Other	% Tail Abnormalities
Other	Other	WBC, RBC, Spheroids, Other
SCROTAL CIRCUMFERENCE (CM) _____ . _____		<b>CLASSIFICATION</b> Interpretation of data resulting from this examination would indicate that on this date, this bull is a: <input type="checkbox"/> Satisfactory potential breeder <input type="checkbox"/> Unsatisfactory potential breeder <input type="checkbox"/> Classification Deferred Re-examination recommended on _____ DATE Signed: _____ MEMBER SOCIETY FOR THERIOGEOLOGY Clinic:
This bull has been examined for physical soundness and quality of semen only. Unless otherwise noted, no diagnostic tests were undertaken for libido, mating ability or infectious disease status of this bull.		
Remarks and Interpretation (diagnosis, prognosis, recommendations)		

BREEDING  
SOUNDNESS  
EXAMINATION

```
graph TD; A([BREEDING SOUNDNESS EXAMINATION]) --> B([STERILE]); A --> C([FERTILE]); A --> D([SUB-FERTILE]);
```

STERILE

FERTILE

SUB-  
FERTILE



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