Slide 1

Small Ruminant: Breeding Soundness Examination

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Outline

- BSE: When and Why
- Parts of the BSE
- Scrotal circumference and its role
- Breeding potential classification
- Spermiogram abnormalities

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Slide 3

Breeding soundness examination

- When?
  - 60 days prior to the breeding season
  - Short day breeders
    - SE USA
      - Late September – late February
    - Season can alter results
      - Out of season
        - Rams→ decreased size and less firm testes
  - Post pubertal

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Slide 4

Breeding soundness examination

- Why?
  - Evaluation of the male
    - Ability to impregnant females in a defined period of time**
    - "Deliver and produce sperm in sufficient quality and quantity to achieve high conception rates and fecundity"**
  - Recover
  - Replace
    - 10% **

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**Tibary A, Bouhliq R, and El Allali K. Ram and buck breeding soundness examination. *Rev. Mor. Sci. Agron. Vét.* 2018; 6(2), pp.241-255.

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Puberty

- Ram
  - ~ 6 months
  - Ewe exposure can hasten puberty onset
- Buck
  - Breed dependent
    - Boer→4-5 months
    - Pygmy → 2-3 months
    - Dairy → ~5-6 months

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Parts of the BSE

- Physical examination
- Reproductive examination
- Scrotal circumference
- Spermiogram

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Physical examination

- **PARASITES**
- Confirmation
  - Limbs and mouth
- Hoof health
- Systemically healthy
  - Caseous lymphadenitis
  - Dermatitis
- Eyes and Coat
- Body Condition Score
  - 3.5/5

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BSE: reproductive exam

- External genitalia
  - Penis
  - Prepuce
    - Preputial orifice
  - Testicles
    - Out of season changes
    - Ultrasound +/-
  - Epididymitis

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Slide 10

Epididymitis

- Inflammation of epididymis
- Mature ram
  - *Brucella ovis*
- Young ram
  - *Histophilus somnii*
  - *Actinobacillus seminis, Haemophilus spp.*
  - Animals on increased nutrition plane

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Epididymitis: *Brucella ovis*

- ROI
  - Mucous membranes,
    - Oral ingestion, homosexual riding, naso-genital contact
  - Venereal transmission
  - Placental infection**
- Affinity for epididymis and accessory sex glands
- Semen quality
  - Decreased early as 2-3 PI
    - Reduced motility and concentration
    - Detached heads

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**Bulgin 1990, Picard-Hagen 2015

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Epididymitis: *Brucella ovis*

- Diagnosis
  - Presumptive
    - Palpation
      - ~20 % clinical signs
    - Spermiogram
      - WBCs
      - Morphology abnormalities
  - Definitive
    - Serology
    - 2 tests 4-8 weeks apart**
    - Histopathology

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**Edmondson, Shipley 2021

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Epididymitis: *Brucella ovis*

- Recommendations***
  - Annual BSE
  - Cull rams with epididymitis
  - Virgin rams
  - Biosecurity (vaccine not legal in US)

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**Ridler 2011

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Systemic wellness

- Additional testing
- Buck
  - *Corynebacterium pseudotuberculosis*
  - *Caprine arthritis-encephalitis (CAE)*

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**Tibary et al. 2018

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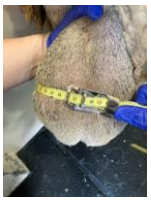
Scrotal circumference

- Estimates volume of testes
  - Testicular volume directly correlated with daily sperm output
- Volume → testicular parenchyma
  - Seasonal changes
    - ⇩ 2-3 cm difference
- Serving capacity



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Scrotal circumference: Rams

Age (months)	Minimal Circumference (cm)
5-6	29
6-8	30
8-10	31
10-12	32
12-14	33
14	33
18+	34

8-14 months Size (cm)	Score	Over 14 months Size (cm)
Less than 28 cm	Questionable	< 32
28-36	Satisfactory	32-40
>36	Excellent	>40

Adaptation from Tibary et al., 2018

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Diagram1: Purdue University Extension, Buck and Ram BSE

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Scrotal circumference: Bucks

- Age in months
  - >14 months
    - SC: >25 cm
- Standards by weight
  - >40 kg breeds
    - ≥25cm
  - Dairy bucks ≥45 kg
    - 25-28 cm
  - Meat bucks ≥45 kg
    - 26-29 cm

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Purdue and Tibary et al.

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Semen Collection & Evalution

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Slide 19

Collection methods

- Electroejaculation
- Artificial vagina

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Photo A: Tibary A, et al. 2018, Ram and Buck BSE

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Electroejaculation

Advantages

- Readily available for single sample
- No training required
- Can collect while animal is sedated/anesthetized
  - 2-5 times , 5-10 minutes apart

Disadvantages

- Inconsistent sample
- ⇧ seminal fluid, ⇩ sperm conc.
  - Increased total volume
    - Compared with AV
- Stress on animal
  - Often vocalize

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**Edmondson, Shipley 2021.

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Artificial vagina

Advantages

- ⇧ Physiologically normal sample
  - Compared to EE
- Less stress on animal
  - Post training
- Can help evaluate libido
- Faster than EE if trained

Disadvantages

- Training of animal required
- Unable to utilize in sedated animal
- Female in estrus
  - Usually required

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**Edmondson, Shipley 2021.

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Collection: Electroejaculation

- Sedation if needed
  - Xylazine
    - 0.05-0.1 mg/kg IV or IM
    - Beware pulmonary edema
  - Reversal
    - Atipamezole

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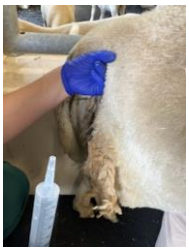

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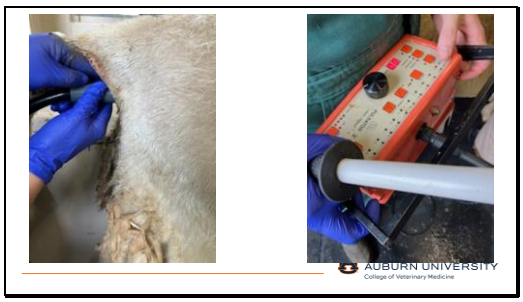

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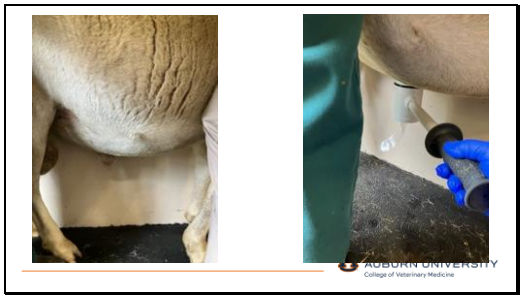

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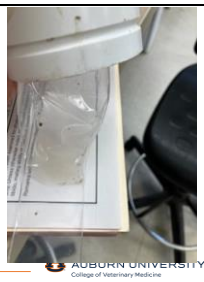

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Spermiogram

- Indicator of testicular and epididymal health
- Presence of a predominant abnormality/defect--> insult timeline
  - Spermatogenesis
    - 48 days seminiferous cycle
    - 12 days epididymal transport
    - 60 days → complete

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Spermiogram: Motility

- Motility
  - Gross
    - Hurricane/wave motion
    - 4x
  - Presence of round cells
    - Spheroids
    - White blood cells
  - Individual
    - Dilute
      - Saline or extender
      - Cover slip
    - Edge of cover slip
    - 4x-10x

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Spermiogram

- Stain/slide preparation
  - Eosin/nigrosin
  - Diff-quick
- 100 sperm @ 100x magnification
- Presence of a predominant abnormality/defect→insult timeline
  - Spermatogenesis
    - 60 days complete
    - 12 days epididymal transport
    - 48 days spermatogenesis

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Spermiogram: Morphology

- Morphology
  - Head
  - Midpiece
  - Tail

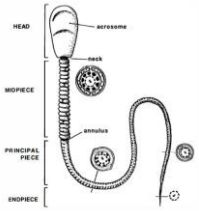

Figure: 3.5: Barth A., Oko R., Abnormal morphology of bovine spermatozoa

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Spermiogram

- Head and midpiece defects
  - Testicular --> spermatogenesis
- Cytoplasmic droplets
  - Epididymal--> transport
- Improper semen handling
  - Not true defects
  - Tail defect
    - Stain osmolality
    - Cold shock

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Spermiogram: Concentration

Ejaculate appearance	Sperm concentration 10^9/ml	Comment
Watery	<0.5	Probably infertile
Cloudy	0.5-1	Probably infertile
Milky	1-3	Low fertility
Creamy	3-4	Probably fertile
Thick Creamy	4	Probably fertile

Photo and chart: Tibary, 2018 Ram and Buck BSE. Table 5

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BSE: Classification

- Ram
  - Excellent, satisfactory, questionable, unsatisfactory
- Buck
  - Excellent, satisfactory, questionable

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Classification requirements: Ram

- Unsatisfactory
  - Fails to meet minimum of single portion of examination
  - Morphology: < 50% normal
  - Motility: < 30%
- Questionable
  - One or greater questionable parameter (fixable)
  - "Deferred"
  - Recheck 60 days
  - Morphology: < 70% normal
  - Motility: < 30%

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Classification requirements:Ram

- Satisfactory
  - Meets all the minimum of all portions of the examination
  - Morphology: ≥ 70% normal
  - Motility: ≥ 30% progressively motile
- Excellent
  - Above and beyond all the minimum requirements
  - Morphology: ≥ 90% normal
  - Motility: > 50% progressively motile

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Classification: Serving Capacity

- Ram
  - Excellent
    - 1:100 ewes
  - Satisfactory
    - 1:50-60 ewes

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Serving Capacity:

Ram : Ewe Ratio	Management condition
1:50	Mature ram paddock mating
1:25	Young ram paddock mating
1:30	Rough terrain
1:15	Synchronized flock
1:10	Out of season breeding

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Recommendations from Tibary et al., Ram and Buck BSE, 2018

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Reference ranges: Rams

Class	Scrotal Circumference (<14 months)	Scrotal Circumference (>14 months)	Motility	Morphology	Debris
Excellent	> 33 cm	> 35 cm	> 50 %	> 90%	no white blood cells
Satisfactory	> 30 cm	> 33 cm	> 30 %	> 70 %	no white blood cells
Questionable	< 30 cm	< 33 cm	< 30 %	< 70 %	may have white blood cells

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Diagram: Purdue University Extension, Buck and Ram BSE

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Reference Ranges: Bucks

Class	Scrotal Circumference (<14 months)	Scrotal Circumference (>14 months)	Motility	Morphology	Debris
Excellent		> 25 cm	> 50 %	> 90%	no white blood cells
Satisfactory	(Information not	available)	> 30 %	> 70 %	no white blood cells
Questionable			< 30 %	< 70 %	may have white blood cells

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Diagram: Purdue University Extension, Buck and Ram BSE

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