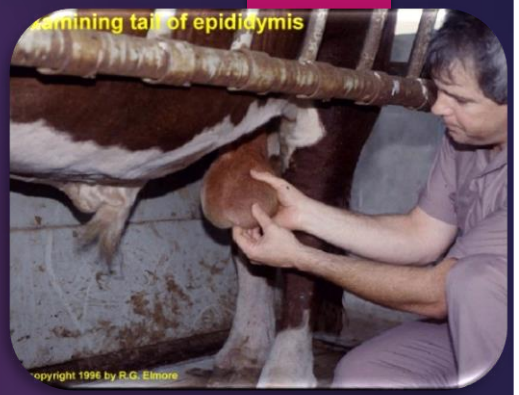
BREEDING SOUNDNESS EXAMINATION OF THE BULL



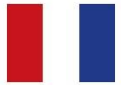
ÉVALUATION DE L'APTITUDE À LA REPRODUCTION DES TAUREAUX

جامعة الإخوة منتوري قسنطينة
UNIVERSITE DES FRERES MENTOURI CONSTANTINE

THERIOGENOLOGY LECTURES – A5

Prof. Sana HIRECHE

Synonymous

- Bull breeding soundness evaluation (BBSE)
- Spanish : Evaluación de la aptitud reproductiva en toros ;
-  French : Évaluation de l'aptitude à la reproduction des taureaux ;
-  German : Bewertung der Zuchtt au glichkeit von Bulle;
-  Portuguese : Avaliação da capacida de reprodutora do touro

HOW TO MAKE EFFICIENT HERD MANAGEMENT ?

- Efficient and economical **herd management** depends a great deal on maintaining **a short, well-defined calving season**
- This requires **highly fertile females and bulls**
- **Low pregnancy rates** are very noticeable, however; potentially greater economic loss may be due to **delayed conception**

Common reproductive indices and their optimal values under ideal circumstances

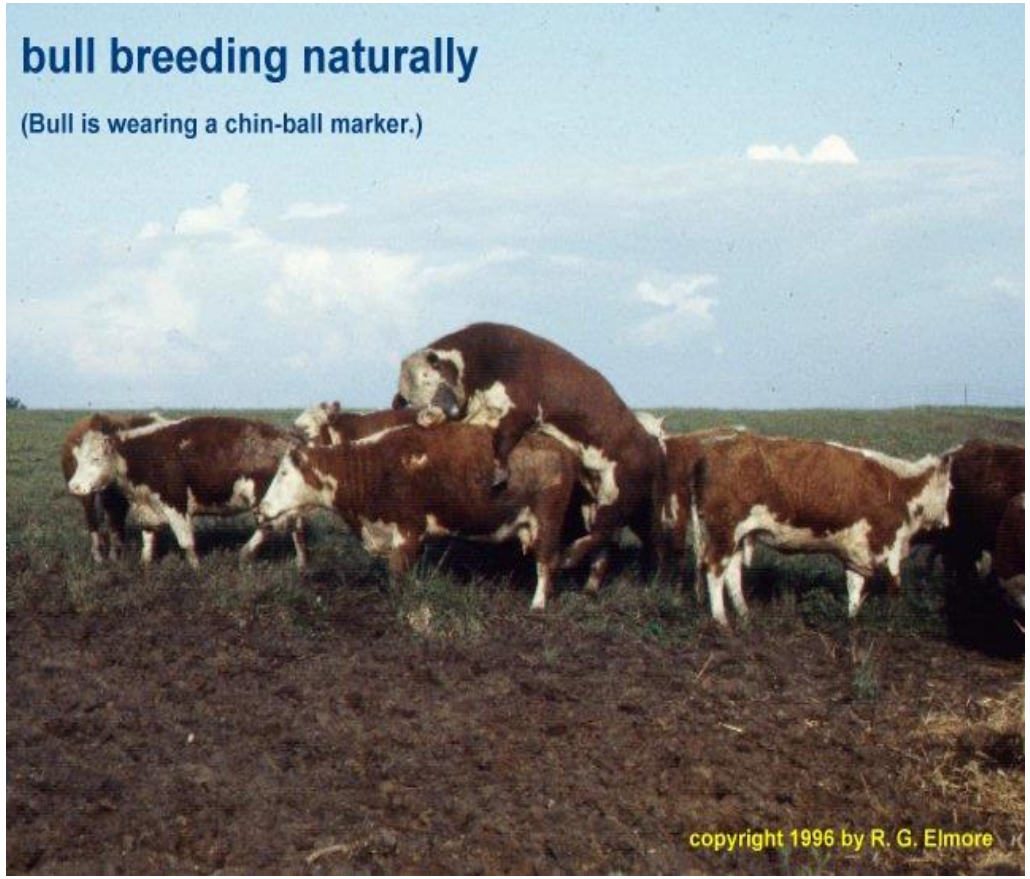
(Source: Wattiaux, University of Wisconsin-Madison 51)

Reproductive index	Optimal value	Value indicating serious problems
Calving interval	12.5 - 13 months	> 14 months
Average days to first observed heat	< 40 days	> 60 days
Cows observed in heat within 60 days after calving	> 90%	< 90%
Average days open to first breeding	45 to 60 days	> 60 days
Service per conception	< 1.7	> 2.5
First service conception rate of heifers	65 to 70%	< 60%
First service conception rate of lactating cows	50 to 60%	< 40%
Cows that conceived with less than 3 services	> 90%	< 90%
Cows with a breeding interval between 18 and 24 days	> 85%	< 85%
Average days open	85 to 110 days	> 140 days
Cows open more than 120 days	< 10%	> 15%
Dry period length	50 to 60 days	< 45 or > 70 days
Average age at first calving	24 months	< 24 or > 30 months
Abortion rate	< 5%	> 10%
Culling rate for reproductive problems	< 10%	> 10%

< = Less than; > = More than

Reproductive function of the bull

- **In natural service**, the bull's contributions to the reproduction process are :
  - **Continuous elaboration of spermatozoïdes**
  - **Detection of cows in heat**
  - **Deposition of semen in the female genital system**
- **In AI**, the last two contributions are realized by the farmer or the inseminator



BULL FERTILITY

- **Testicular circumference** is related to the fertility of mature bulls

BULL FERTILITY

- Daily ejaculation of a sound bull over an extended period of time does not impair fertility but it varies with:
  - **Age and sexual maturity**
  - **Proper nutrition**
  - **Sexually transmitted diseases**
  - **Libido (sexual drive)**

BULL FERTILITY

- In the case of artificial insemination, the fertility of a bull is affected by :
  - **Semen dilution, processing, storage and handling** from the time it is **collected** to the time it is **deposited** in the cow's uterus

BULL BREEDING SOUNDNESS EXAMINATION

- Many studies showed that **approximately 1of every 5 bulls** had **inadequate semen quality**, **physical soundness**, or **both**
- When **evaluation of serving capacity** is included about **1 in 4 bulls** is **unsatisfactory** (Barth, 2018).

BULL BREEDING SOUNDNESS EXAMINATION

- Breeding soundness evaluation is a **screening method for reducing the risk of using low fertility bull** :
  - **Useful**
  - **Low-cost**

Definition

- Bull breeding soundness evaluation (BBSE)
  - **A comprehensive evaluation of a bull's fertility potential**

THE PRIMARY OBJECTIVE OF BBSE

- **To ensure that bulls used in breeding programs are capable of fertilizing females effectively**, there by **contributing to overall reproductive success** and **genetic improvement of the herd**

Table 24. Approximate Guide to the Frequency of Service and the Number of Females Allotted to Male Domestic Animals*

Species	Immature Males Hand Breeding		Mature Males Hand Breeding	
	No. of Services/week	No. of Females per Season (year)	No. of Services/week	No. of Females per Season (year)
Stallion	2–5	15–40	3–12	30–120
Bull	2–4	20–60	4–12	80–120
Boar	2–4	10–40	4–10	30–60
Dog	1–2	(20–40)	2–6	30–80
Ram (Buck)	6–12	(30–40)	6–24	40–80

	Pasture Breeding	Pasture Breeding
	(No. of Females) per season (year)	(No. of Females) per season (year)
Bull	10–15	10–25**
Boar	10–20	20–40
Ram (Buck)	20–30	40–80***

*This guide will vary greatly for individual males according to their fertility, sperm producing capacity, degree of libido, age and physical condition. It will also be influenced by systems of management, size of pasture or range and nutrition of the sire and dam. Frequent short periods of sexual rest are desirable.

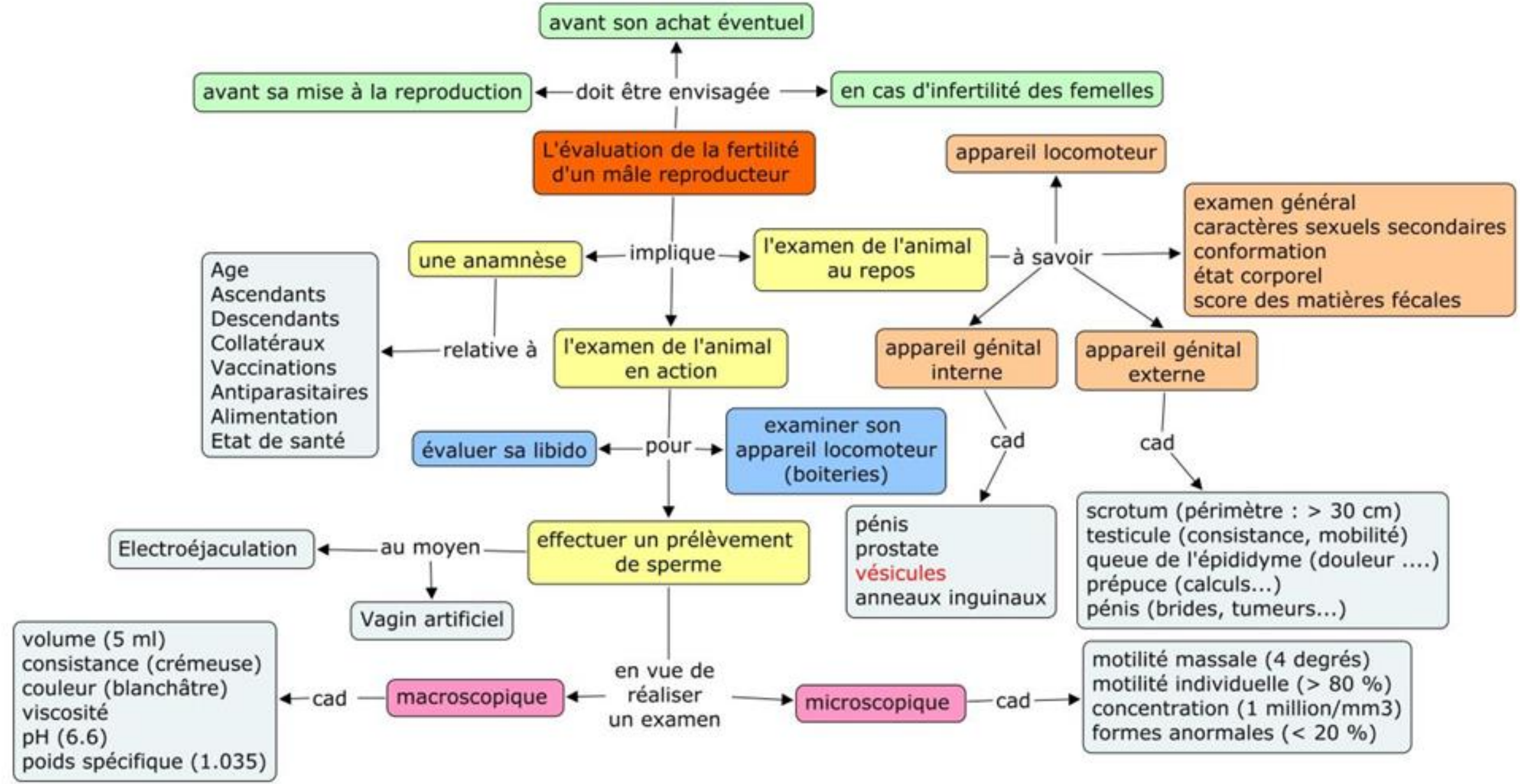
**This figure is for range cattle with a limited breeding season. For dairy cattle on improved pasture with a year-long breeding season this figure could be increased 3 or 4 times.

***Vigorous yearling to adult rams may breed up to 30 to 40 ewes per month; 3 to 8 percent of goat flocks should be bucks.

COMPONENTS OF THE BBSE

- Health and physical examination
- Semen evaluation
- Libido and mating ability assessment

Carte conceptuelle de l'évaluation de la fertilité du taureau reproducteur (Prof Ch. Hanzen 2015



Libido Testing

- Libido testing is not routinely performed when doing a BSE.
- The **'one bull method'** has a restrained heifer and you allow the bull 10-15 minutes to mount the heifer. A bull should mount at least once. If he does not mount, he should fail and be tried again.
- The **'multiple bull method'** used **4 heifers on a pen perimeter, with 5 bulls turned in with them**. Each bull should serve at least **3 times in 40 min**.
- As they breed you can remove those that do breed to allow the others more chances to breed without any bull dominance affecting the breeding performance.

LIBIDO TESTING

FACTORS INFLUENCING LIBIDO

- **Physical problems** such as
  - Lameness
  - Obesity
  - Herniation

FACTORS INFLUENCING LIBIDO

- **Physical problems** such as
  - Penile abnormalities
  - Illness
  - High-energy diets may be disadvantageous to libido, whereas underfeeding is probably disadvantageous only when it is sufficient to affect physiologic well-being of bull

Goals for a bull BSE

- To provide a standardized, unambiguous report **on the suitability of a bull to be used in a breeding program**
- To **utilize the data to facilitate genetic selection for fertility traits**

Breeding soundness exam

- The evaluation process needs to be :
  - **Repeatable**, **reproducible**, **efficient**, and **safe** for both the **bull and the clinician**

The American Society for Theriogenology (SFT)

- The assimilation of fertility parameters into a bull fertility evaluation process formed **the foundation of BBSE procedures**
- The earliest documentation in western literature of standardized procedures, interpretation, and reporting for BBSEs was described in **1954 by a group called the Rocky Mountain Society for the Study of Breeding Soundness of Bulls**

https://www.therio.org/

The American Society for Theriogenology (SFT)

- Following several iterations, this group evolved **in 1974** into **the American Society for Theriogenology (SFT)**, with the basis for current protocols, data recording, and reporting being developed

https://www.therio.org/

BREEDING SOUNDNESS EXAM

- BBSEs are now conducted by veterinarians throughout the world
  - To estimate the potential for a bull to sire calves under a range of management conditions
    - The assessment of **bulls pre-sale for seed-stock producers**; **commercial producers using natural mating in multi-sire or single-sire situations**; **assessment for the ability to collect and process frozen semen**; and **assessment for insurance purposes.**

BREEDING SOUNDNESS EXAM

- The processes **for determining and reporting the suitability of a bull for breeding** have evolved with a degree of autonomy in different regions
  - **While there are many similarities, there are also variations** in the techniques employed, interpretation of the findings, reporting of results, and systems for oversight of the processes within the **veterinary profession**

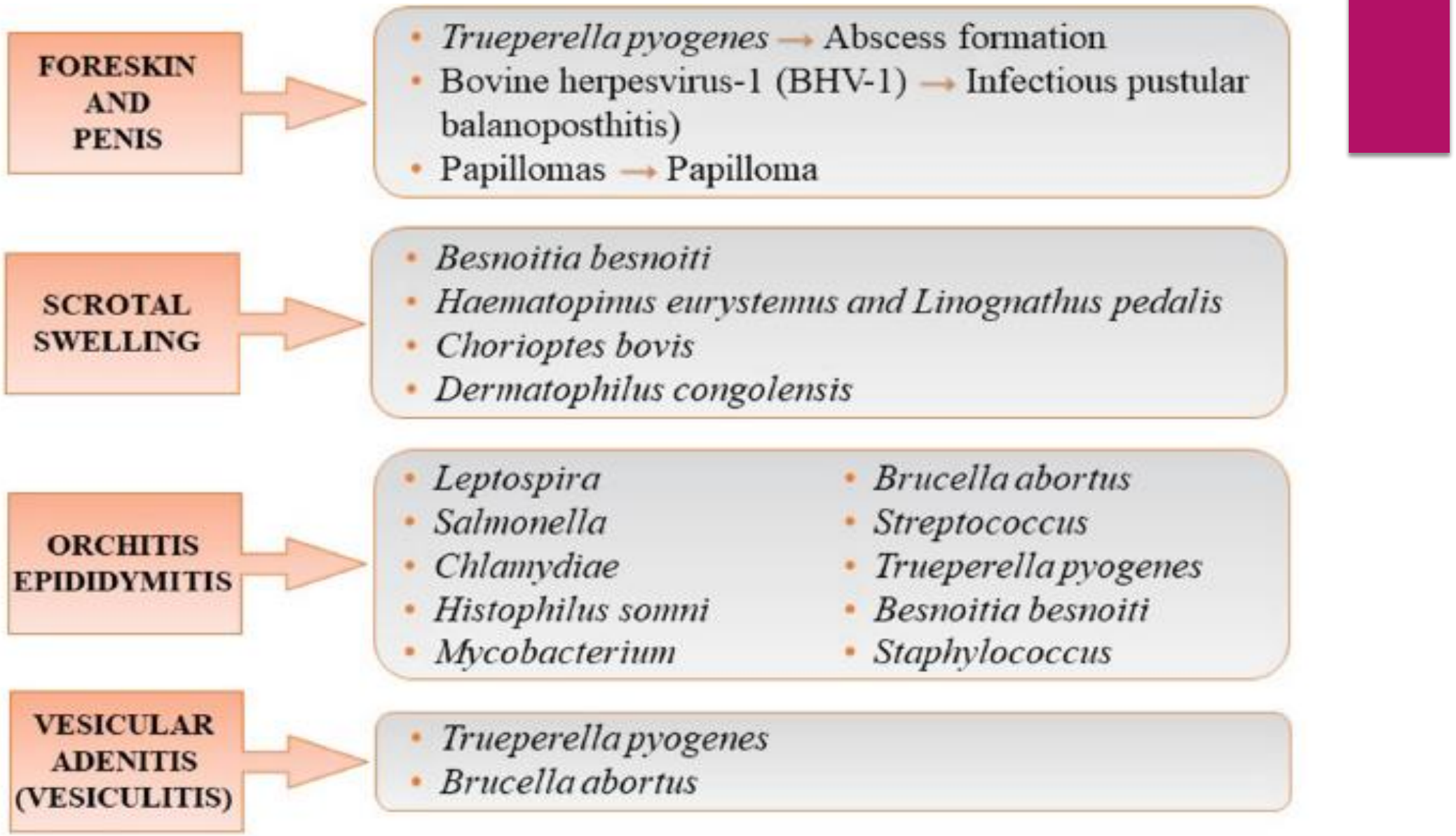
BULL REEDING SOUNDNESS EXAM

- The BBSE process can be condensed into the following **7 categories**:

1. **General physical examination**
2. **Reproductive physical examination**
3. **Measurement of scrotal circumference (SC)**
4. **Semen evaluation – bull-side**
5. **Semen evaluation – morphology and other laboratory evaluations**
6. **Serving ability or capacity**
7. **Testing for specific infectious or genetic diseases**

BULL REEDING SOUNDNESS EXAM

- Numerous transmissible diseases can be detected in the examination of the reproductive organs:
  - Problems for copulation (impotentia coeundi), normally associated with problems in libido, erection and ejaculation,
  - Alterations in sperm quality causing problems in conception (impotentia generandi)
- Decrease in reproductive capacity (**subfertility**), temporary failure (**infertility**), or permanent failure (**sterility**).



Main pathogenic agents that cause organic dysfunctions and alterations in semen quality (Ortega-Mora et al., 2021)

- **Transmissible diseases subjected to governmental control and eradication programs**
  - Tuberculosis → 'Unsatisfactory Breeder'
  - Brucellosis → 'Unsatisfactory Breeder'
- **Sexually transmitted diseases associated with reproductive failure in females**
  - Trichomoniasis → 'Unsatisfactory Breeder'
  - Bovine Genital Campylobacteriosis → 'Classification Deferred':
    - With treatment and proof of its effectiveness → 'Satisfactory Potential Breeder'
    - Without treatment → 'Unsatisfactory Breeder'
  - Bovine Viral Diarrhea (BVD) → 'Unsatisfactory Breeder'
  - Infectious Bovine Rhinotracheitis (IBR) → 'Unsatisfactory Breeder'
- **Diseases for which the bull may be a carrier**
  - Bovine Besnoitiosis) → 'Questionable':
    - 'Unsatisfactory Breeder' → Farm free from this disease / Unsatisfactory semen quality
    - 'Satisfactory Potential Breeder' → If seminal quality is satisfactory and only for the mating of infected females
  - Paratuberculosis → 'Unsatisfactory Breeder'
  - Others
    - Leptospirosis
    - Chlamydiosis
    - Q fever
    - Babesiosis
    - Theileriosis
    - Anaplasmosis

Diseases to consider in health assessment and consequences of its diagnosis on bull evaluation (Ortega-Mora et al., 2021),

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) 3399 - www.therio.org

Jeffrey Brooks
P.O. Box 199
Starkville , MS 39759
(662) 321-4567

BSE Date: 6/10/2013	BSE Case No: 13-401
Bull Name: "TEDDY"	Breed: Angus
Bull I.D. No:	Brand ☐ Tattoo ☐ Ear Tag ■
Bull Birth Date:	Age (Mo.) 84

PHYSICAL EXAMINATION

Body Condition Score: Beef - 6
Thin ☐ Moderate ☐ Good ■ Obese ☐

	Pelvic Height	Pelvic Width	Pelvic Area
Feet/Legs	■	RR foot grown out no lameness	
Eyes	■		
Vesicular Glands	■		
Ampullae/Prostate	■		
Inguinal Rings	■		
Penis/Prepuce	■		
Testes/Spermatic Cord	■		
Epididymides	■		
Scrotum (Shape)	■		
Other			
SCROTAL CIRCUMFERENCE (CM)	40 . 0		

The SFT electronic BBSE form.

Source: From Society for Theriogenology, Bull Breeding Soundness Evaluation form.© 1992, The Society for Theriogenology.

CLASSIFICATION

Interpretation of data resulting from this examination would indicate that on this date this bull is a:

Satisfactory Potential Breeder

Re-examination recomended on:

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

Signed: _____

Member - Society for Theriogenology

Bull Breeding Soundness Evaluation

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Phone 334/395-4666 • Fax 334/270-3399 • www.therio.org

OWNER	CASE NO.	DATE
ADDRESS	BULL NAME	BREED
ZIP	I.D. NO.	Brand ❑ Tattoo ❑ Ear Tag ❑
TELEPHONE ( )	BIRTH DATE	AGE (MO.)
HISTORY: Previous BSE	DATE	CASE NO. / CLASSIFICATION

PHYSICAL EXAMINATION

Body Condition Score _____ Thin ❑ Moderate ❑ Good ❑ Obese ❑
Beef 1, 2, 3, 4, 5, 6, 7, 8, 9 Pelvic Ht. _____ Width _____ Area _____
Dairy 1, 2, 3, 4, 5

Feet/Legs	❑
Eyes	❑
Vesicular Glands	❑
Ampullae/Prostate	❑
Inguinal Rings	❑
Penis/Prepuce	❑
Testes/Spermatic Cord	❑
Epididymides	❑
Scrotum (Shape)	❑
Other	

SCROTAL CIRCUMFERENCE (CM) _____

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)

SEMEN EXAMINATION

Collection Method: EE ❑ AV ❑ Massage ❑
Response: Erection ❑ Protrusion ❑ Ejaculation ❑

Semen Characteristics	Ejaculate 1	Ejaculate 2
Motility — Gross (or) Individual (%)		
% Normal Cells		
% Primary Abnormalities		
% Secondary Abnormalities		
WBC, RBC, Other		

CLASSIFICATION

Interpretation of data resulting from this examination would indicate that on this date, this bull is a:

❑ Satisfactory potential breeder
❑ Unsatisfactory potential breeder
❑ Classification Deferred

Re-examination recommended on _____ DATE

Signed: _____ MEMBER—SOCIETY FOR THERIOGENOLOGY

Clinic:

Reference Tables for Evaluation of Scrotal Circumference and Spermiogram

Minimum Recommended Scrotal Circumference	
Age	SC(CM)
* ≤ 15 MO	30
> 15 ≤ 18 MO	31
> 18 ≤ 21 MO	32
> 21 ≤ 24 MO	33
> 24 MO	34

Minimum Recommended Motility is: 30% or FAIR (F)

Mass Activity (Gross)	Rating	Individual
Rapid Swirling	Very Good (VG)	≥ 70%
Slower Swirling	Good (G)	50 - 69%
Generalized Oscillation	Fair (F)	30 - 49%
Sporadic Oscillation	Poor (P)	< 30%

Sperm Morphology

Minimum Recommended Morphology is: 70% Normal Cells

Primary sperm Abnormalities

- Underdeveloped
- Double forms
- Acrosome defect (e.g. knobbed acrosome)
- Narrow heads
- Crater/Diadem defect
- Pear-shaped defect
- Abnormal contour
- Small abnormal heads
- Free abnormal heads
- Abnormal midpiece
- Proximal droplet
- Strongly folded or coiled tail
- Accessory tails

Secondary sperm Abnormalities

- Small normal heads
- Giant and short broad heads
- Free normal heads
- Detached, Folded, Loose acrosomal membranes
- Abaxial implantation
- Distal droplet
- Simple bent tail
- Terminally coiled tail

Other cells

- Epithelial cells
- Erythrocytes
- Medusa formations
- Sperm precursor cells
- Round cells
- White blood cells

For more information on sperm morphology refer to:
Abnormal Morphology of Bovine Spermatozoa.
A.D. Barth and R.J. Oko. 1989. Iowa State University Press, Ames.

To be classified a Satisfactory Potential Breeder requires a satisfactory Physical Examination and minimum values for Scrotal Circumference, Motility and Morphology. Any bull not meeting minimums is either classified as an Unsatisfactory Potential Breeder or classification may be Deferred at the discretion of the evaluator.

*It should be noted that it is common for yearling bulls, due to immaturity, to require a second fertility examination to achieve satisfactory potential breeder status.

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TELEPHONE ( )	BIRTH DATE	AGE (MO.)
HISTORY: Previous BSE — DATE	CASE NO.	CLASSIFICATION

PHYSICAL EXAMINATION

Body Condition Score _____ Thin ❑ Moderate ❑ Good ❑ Obese ❑
Beef 1, 2, 3, 4, 5, 6, 7, 8, 9 Pelvic Ht. _____ Width _____ Area _____
Dairy 1, 2, 3, 4, 5

Feet/Legs ❑

Eyes ❑

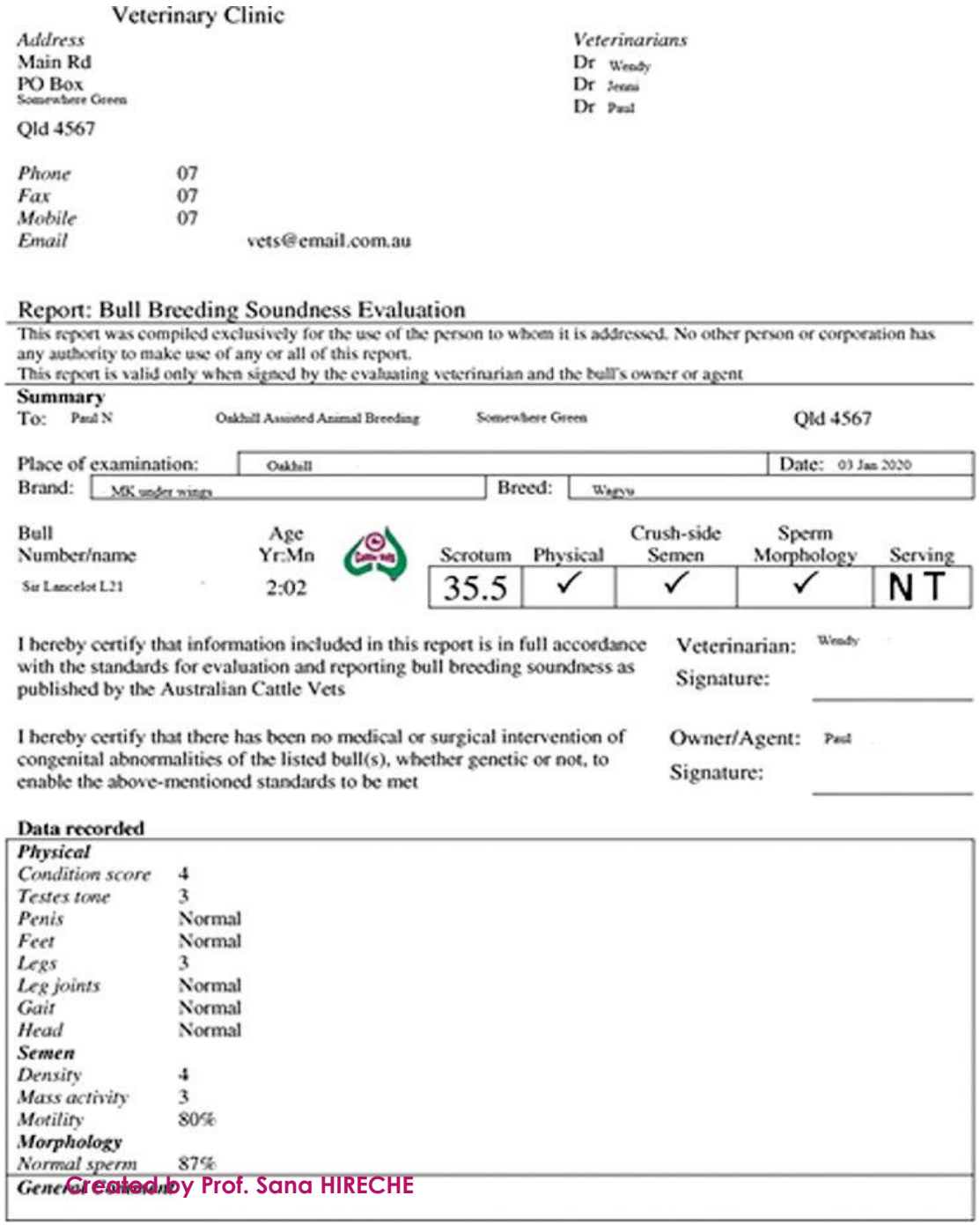
Vesicular Glands ❑

SEMEN EXAMINATION

Collection Method: EE ❑ AV ❑ Massage ❑

Response: Erection ❑ Protrusion ❑ Ejaculation ❑

Semen Characteristics	Ejaculate 1	Ejaculate 2
Motility — Gross (or) Individual (%)		



Veterinary Clinic

Address
Main Rd
PO Box
Somewhere Green
Qld 4567

Veterinarians
Dr Wendy
Dr Jenni
Dr Paul

Phone 07
Fax 07
Mobile 07
Email vets@email.com.au

Report: Bull Breeding Soundness Evaluation

This report was compiled exclusively for the use of the person to whom it is addressed. No other person or corporation has any authority to make use of any or all of this report.
This report is valid only when signed by the evaluating veterinarian and the bull's owner or agent

Summary

To: Paul N Oakhill Assisted Animal Breeding Somewhere Green Qld 4567

Place of examination: Oakhill Date: 03 Jan 2020
Brand: MK under wings Breed: Wagyu

Bull Number/name	Age Yr:Mn	Scrotum	Physical	Crush-side Semen	Sperm Morphology	Serving
Sir Lancelot L21	2:02	35.5	✓	✓	✓	NT

I hereby certify that information included in this report is in full accordance with the standards for evaluation and reporting bull breeding soundness as published by the Australian Cattle Vets

Veterinarian: Wendy
Signature:

I hereby certify that there has been no medical or surgical intervention of congenital abnormalities of the listed bull(s), whether genetic or not, to enable the above-mentioned standards to be met

Owner/Agent: Paul
Signature:

Data recorded

Physical	
Condition score	4
Testes tone	3
Penis	Normal
Feet	Normal
Legs	3
Leg joints	Normal
Gait	Normal
Head	Normal
Semen	
Density	4
Mass activity	3
Motility	80%
Morphology	
Normal sperm	87%
General comments	

Created by Prof. Sana HIRECHE

An example of the BBSE report from the Australian system

The certificate includes **the identity of the client and place of examination; bull ID, breed, and age**; an area for summary of the veterinary interpretation for each aspect of the examination; a signed statement by the veterinarian that the procedures outlined in the ACV BBSE manual have been followed; and a signed statement by the vendor that there has been no surgical or medical intervention. Multi-bull report formats are also available.

Source: From AVA, BBSE report from the Australian system, © Australian Veterinary Association Ltd.

Evaluating and Reporting Veterinary Bull Breeding Soundness

Purpose: The Veterinary Bull Breeding Soundness Evaluation (VBBSE) is a tool used to identify risk factors that may affect bull fertility in a natural service situation.

Definitions:

ACV Standards: as published in Beggs et al (2013) *Veterinary Bull Breeding Soundness Evaluation. Published by ACV in 2013 and available from the ACV office.*

Components of the VBBSE

Australian Cattle Veterinarians (ACV) uses the following components to evaluate bull as part of the VBBSE:

- *Scrotum*- Scrotal circumference measured as per published ACV method and reported in cm.
- *Physical*- Examination of bull's structure and genetalia
- *Semen*- Crush-side visual and microscopic assessment
- *Morphology*- Standardised high-magnification microscopy of preserved sperm.
- *Serving Ability*- Standardised test used to evaluate the ability of a bull to mate normally

ACV recommends that all of the above components be assessed.

Report Indicators

Detailed data is reported as either actual measurements, Yes/No, Normal/Suspect/Abnormal, or on a scale as indicated in published ACV standards. A summary risk assessment of each VBBSE component is provided and uses the following key:

✔	Tick - All attributes for this component measured were consistent with the ACV standards. No risk factors for reduced fertility were identified during for this part of the VBBSE examination.	Q	Qualified - Not all attributes for this component were consistent with ACV standards but these abnormalities may not necessarily preclude the bulls use. A further comment will be provided. **The client should seek advice from their cattle veterinarian as to the suitability of this bull for a particular purpose. Retesting may be recommended.**
✘	Some attributes for this component measured were not consistent with ACV standards. This bull has a significant risk of reduced fertility in the short term at least. Because some conditions may be temporary, the client should seek advice from their cattle veterinarian.	NT	This VBBSE component was not evaluated or not fully evaluated either at the owners request or as indicated.

Using a Veterinary Bull Breeding Soundness Evaluation (VBBSE) report

The report indicates ***the level of risk of reduced fertility*** at the time of testing the bull, and helps predict whether a bull is likely to be able to seek out oestrus females, mate them repeatedly, impregnate them with good quality semen, if the bull were to be put into a paddock mating situation in the short term. The published standards have been selected as the best indicators, but are ***not a guarantee*** that the bull is either fertile, sub-fertile, or infertile.

The ***VBBSE report applies tothe date of the examination*** and no responsibility can be taken for any subsequent events that may affect the ability of the bull to breed satisfactorily or otherwise. In consultation with a cattle veterinarian, clients should consider all aspects of bull fertility when requesting an examination and choose whichever evaluation procedures will best minimise the risk of herd sub-fertility or infertility due to bull failure, or are necessary to meet specific transaction requirements.

The report can only indicate whether b[illegible]sures and professional judgement of the cattle veterinarian. **Overall judgement of a bull as fertile or sound is not appropriate.** However, bulls may be d[illegible] indicators of this. A prognosis (predicted future status) based on detailed data collected may be provided where thresholds are not achieved or there are other indicators of sub-fertility or infertility.

Limitations of the VBBSE report

The report indicates a level of risk — *it* [illegible] management changes. (Bulls, and especially fat bulls, experiencing these events should be re-examined after acclimatisation.) As all possible components of a VBBSE may not be conducted, there always remains a risk that bulls may not reach their full potential.

ACV recommends that all bulls should be vaccinated against/tested for local endemic diseases.

As with the South African system, Australian BBSE reports have a back-page description explaining the process, report symbols, and limitations and qualifiers to the process. *Source:* From AVA, The South African system, Australian BBSE reports, © Australian Veterinary Association Ltd.

The standard veterinary BBSE certificate used in South Africa

Veterinary Certificate of Bull Breeding Soundness

I the undersigned, being a veterinarian registered with the South African Veterinary Council, hereby certify that on this _____ day of _____ 20___, at _____, on the request of _____, I performed the examinations and tests as indicated hereunder on the bull identified below. In my opinion the bull is breeding sound in terms of the standards listed on the reverse side of this certificate for the purposes of (encircle the letter):

A: Sale or own use	B: Semen donation for the purposes of sale	C: Insurance

Identification of the bull

Breed: _____ Age: _____ Colour: _____

Tattoos: _____ Brand: _____

Ear notches: (drawn in) R  L

Ear tags: _____

Name: _____

Name of owner: _____

Residential address: _____

Telephone: _____ Fax: _____

Residential address of the animal *(at the time of examination)*: _____

Examinations and tests: (Those tests for which the "Done" blocks are circled were performed whereas those for which the "Not done" blocks are circled were not performed).

	Circle the options that apply to the bull		Use classes for which tests are recommended			Reason not done: (not necessary to complete if test not indicated for this bull)
General clinical examination			A	B	C	Test must be done
Detailed clinical examination	Done	Not done		B	C	
Examination of the genital system			A	B	C	Test must be done
Semen collection and evaluation			A	B	C	Test must be done
Contagious abortion (blood test)	Done	Not done	A	B	C	
Tuberculosis (skin test)	Done	Not done	A	B	C	
Trichomonosis (sheath wash or scraping)	Done	Not done	A	B	C	
Number of tests for trichomonosis	0 1 2 3					
Campylobacteriosis (sheath wash or scraping)	Done	Not done	A	B	C	
Number of tests for Campylobacteriosis	0 1 2 3					
Bovine virus diarrhoea (antigen test)	Done	Not done	A	B	C	
Serving ability	Done	Not done		B	C	
Other tests (specify):						

Further comments: _____

Signed _____ Address or stamp of practice:

Name _____

Qualification _____ SAVC no. _____

Date _____ day of _____ 20 _____

See reverse side for minimum standards and explanatory notes

BBSE GOALS BRIEFLY

- Identify bulls with a greater probability of being **subfertile or infertile**
- **Diagnose** fertility problems in bulls

BBSE GOALS BRIEFLY

- According to the SFT 1993 guideline, in order to be classified as satisfactory potential breeders, bulls must :
  - Be free of any relevant physical abnormalities,
  - Have a **minimum SC of 30–34 cm** depending on **age**,
  - **Have ≥30% progressively motile sperm**
  - **Have ≥70% morphologically normal sperm**

Minimum scrotal circumference (cm) for breeding soundness classification of bulls of different breeds at different ages according to the guidelines from the Western Canadian Association of Bovine Practitioners (Barth, 2000)

Age (months)	Angus, Brown Swiss, Gelbvieh, Pinzgauer, Simmental	Charolais, Hereford, Holstein Maine Anjou, Red Poll, Salers, Shorthorn	Blonde d'Aquitaine, Galloway, Limousin, Texas Longhorn
12	32	30	29
13	33	31	30
14	34	32	31
15–20	35	33	32

Basic Physical Examination

- For a bull to survive and function as a natural service sire (pasture or range environment), he must be able to walk, eat, see, and bear weight on his back legs

Basic Physical Examination

- A basic examination should begin with a **history**, **examination at a distance**, and an **assessment** of a bull's **conformation**, **gait**, and **overall appearance**

BBSE

- The history can provide the examiner information on genetics, status, management, vaccination, disease testing programs, and herd disease history
- Observation of the bulls in the herd will provide an overview of the animals' meat condition, approximate weight, herd uniformity, skin, hair condition, and locomotor problems

History

- Age of first service
- Date of last service
- Previous examinations
- Disease and vaccinatioin history
- Transport
- Breeding system – Ratio of bulls to cows
- Herd health history / conception rates

BBSE: The Physical Examination

- When a bull breeding soundness examination (BBSE) is performed for the purpose of **evaluating a bull's potential to breed in a natural service situation**, the physical component takes on paramount significance
- In fact, as soon as **any physical abnormality that would impede natural service is observed, or the bull does not meet the minimum standards for scrotal circumference (SC)**, the examination **need not** proceed to evaluation of **semen characteristics**

BBSE : Physical examination

- Goals of the physical examination portion of a BBSE are :
  - The identification of undesirable genetic traits
  - The identification of structural or physical impediments to breeding
  - Detect pathologies of the reproductive tract

BBSE : Physical examination

- The SC, is an **indirect metric for testicle size** and thus sperm production potential, must be measured and **meet minimum standards**

BBSE

- Individual examination of the bull starts from the head
- Ocular conditions resulting in total or partial decrease of vision, strabismus, and/or blindness should be identified **(squamous cell carcinomas, corneal damage, and lymphomas)**

General Physical Examination

- General Conformation Defects
- Eyesight
- Mastication problems
- Locomotory problems
- Hereditary Defects
- Body Condition

External Genitalia

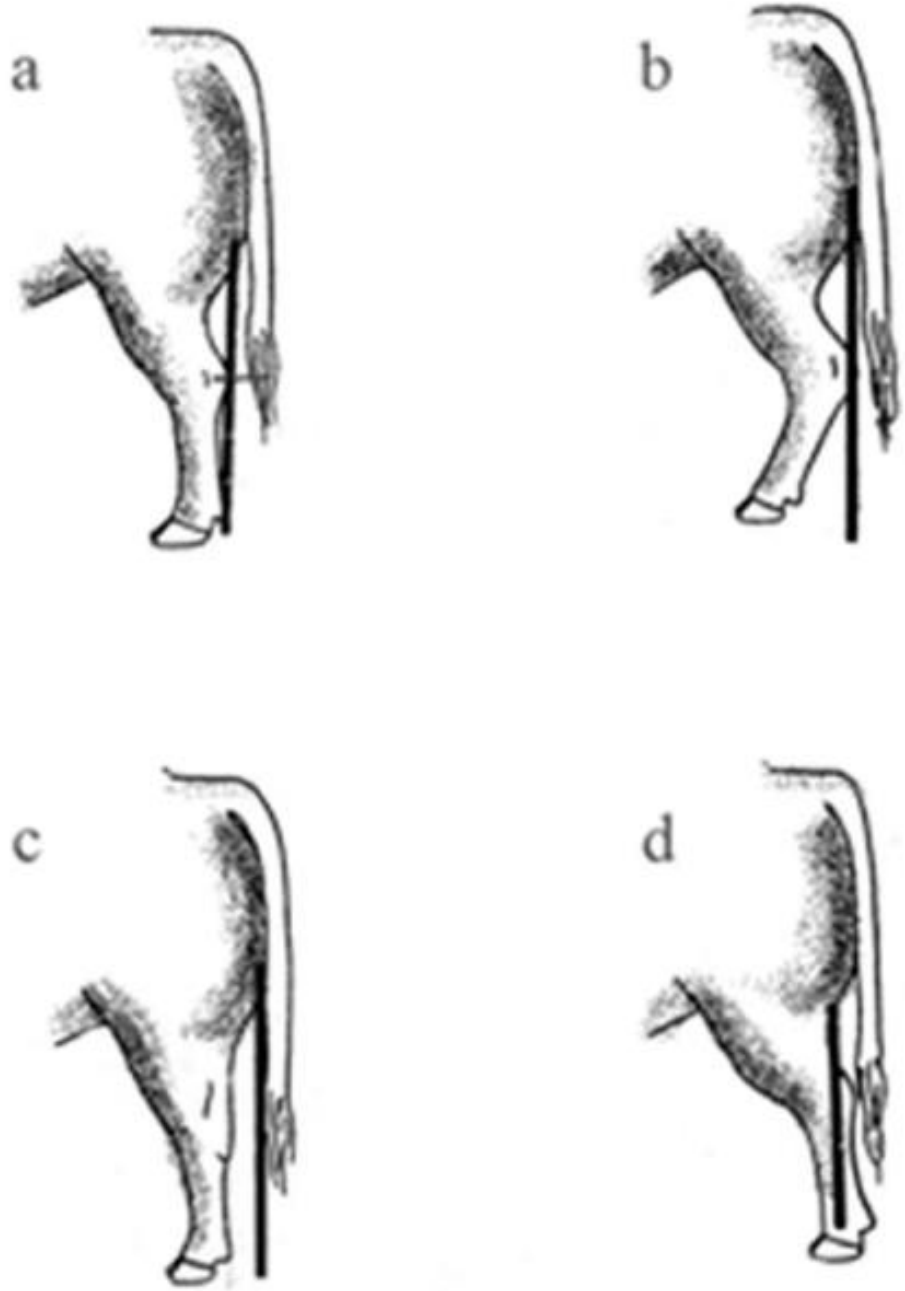
- Scrotum
- Testicles
- Spermatic cord
- Epididymides
- Sheath
- Penis
- Scrotal Circumference

Examination at a Distance

- If possible, the bulls should be observed from the fence of the holding pen while they are standing quietly
- This is a good time to observe their conformation, and overall appearance
- Bull identification numbers are collected for those that will need closer examination for any problems that may be seen

Examination at a Distance

- Move through the bulls slowly while noting any other problems
- This is a good time to observe each bull's gait, possible foot issues, sight deficiencies, and bilateral symmetry
- If they are being unloaded at a veterinary facility for BBSE, watch them as they are being unloaded as stepping off a trailer can exacerbate lameness signs that you can check more closely


a
b
c
d

Examination at a Distance

- Feet and legs are often the trait that determines his ability to service cattle and his longevity as a sire
- Hoof and hock abnormalities lead to lameness, which affects his ability to accomplish this purpose, as well as lowering sperm quality

Examination at a Distance

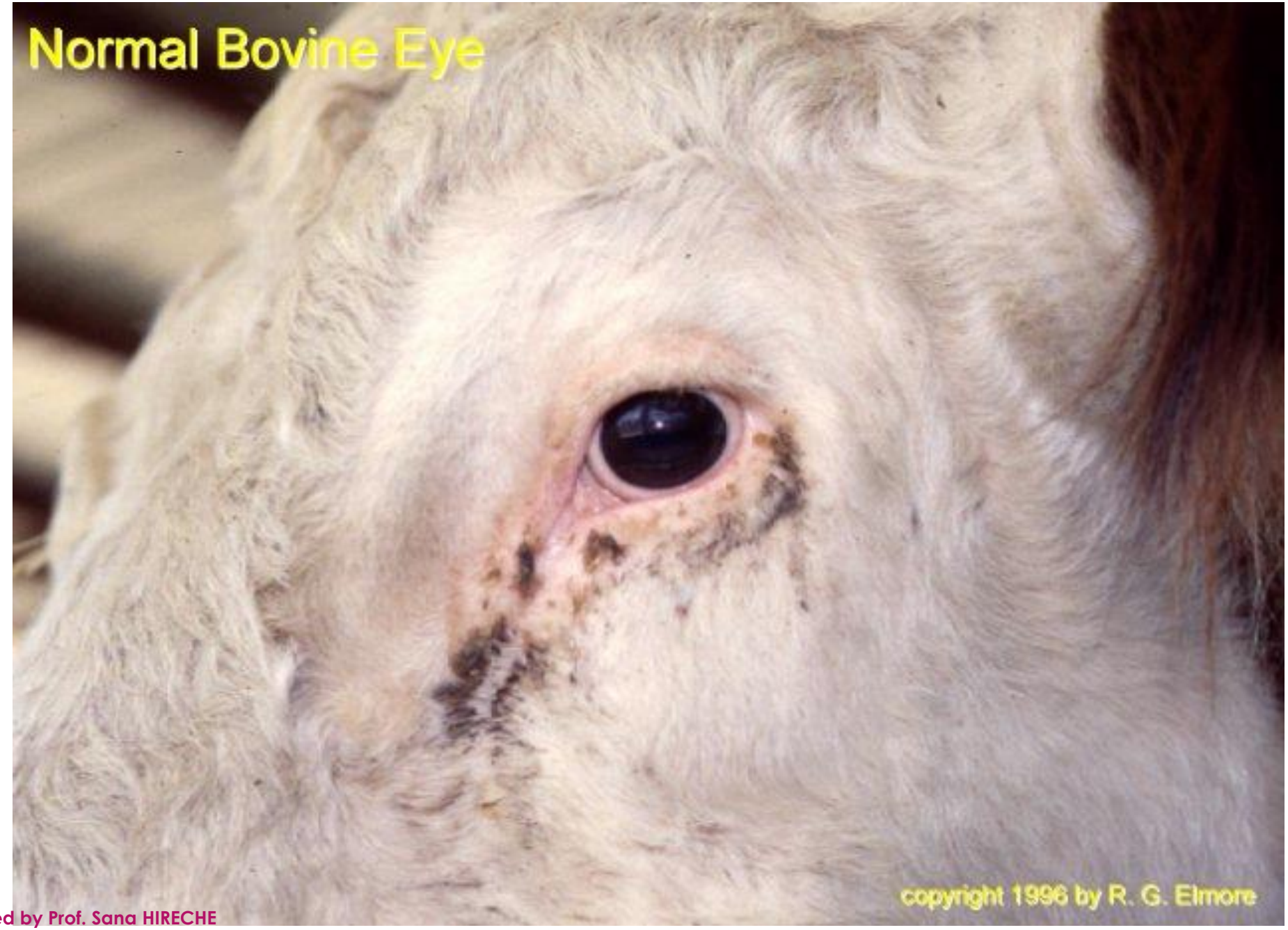
- Screw claw, chronic laminitis, and interdigital fibromas are common.
- The incidence of screw claw appears to be increasing in beef breeds and is considered heritable by the American Association of Bovine Practitioners.

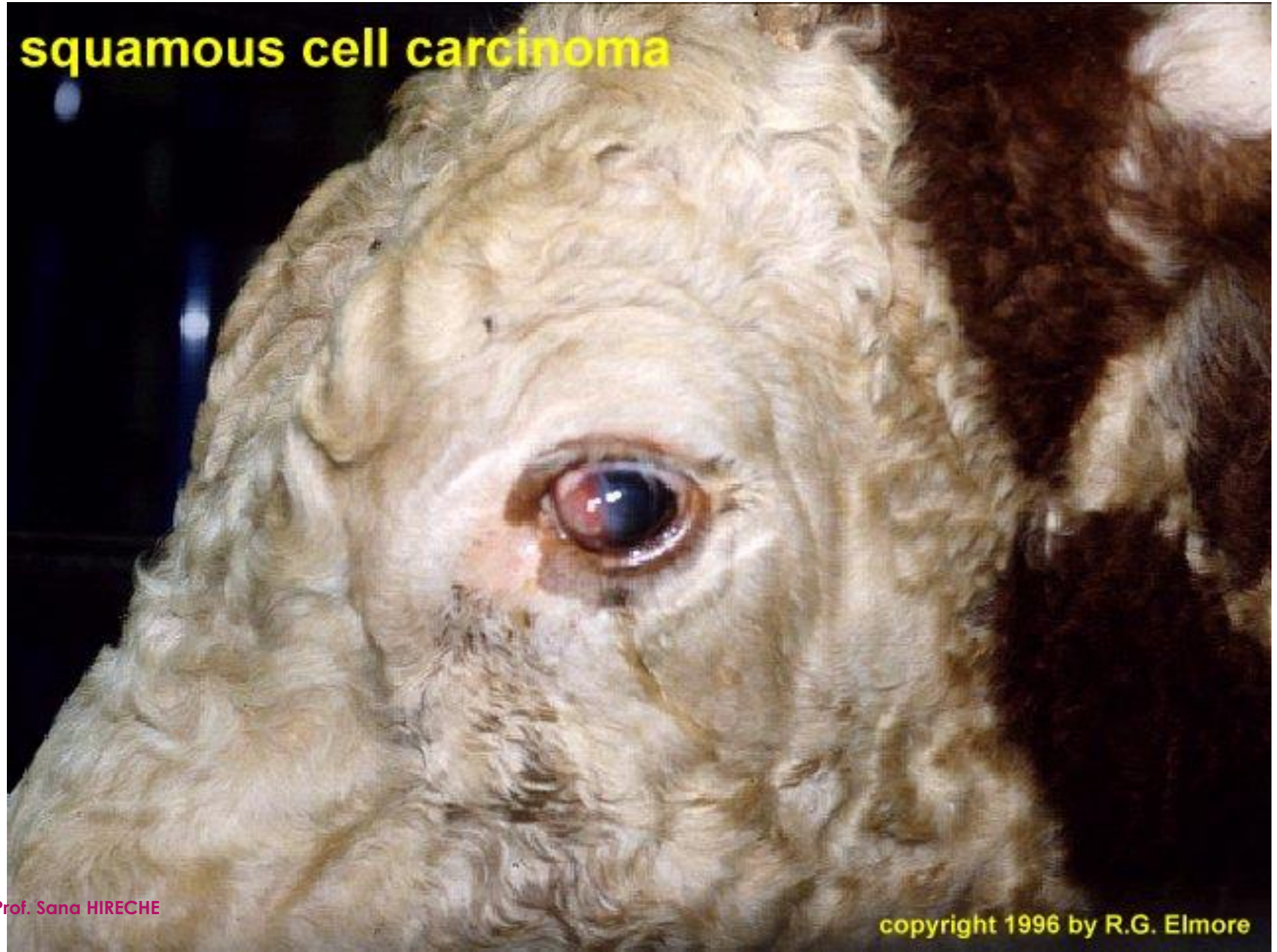
Examination at a Distance

- Moving up the legs, stifle and hock injuries such as collateral ligament rupture, meniscal injuries, and anterior cruciate ligament (ACL) rupture should all be investigated as they will interfere with copulation and fertility

Examination Close Up

- The areas on and around the eyes should be examined for squamous cell carcinomas, corneal damage, and lymphomas
- The nasal passages are checked for even and equal air flow, the oral cavity is examined for abnormalities, and the age of the bull is confirmed by checking the dentition
- This is also a good vantage from which to observe the front feet for interdigital fibromas and the screw claw abnormality


Normal Bovine Eye
copyright 1996 by R. G. Elmore


squamous cell carcinoma
copyright 1996 by R.G. Elmore

Corkscrew claw. Note how outer claw curves over inner claw

- A three-year-old Angus bull that exhibits the screw claw abnormality.
- This bull will require annual hoof trimming to remain sound.

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Examination of the oral cavity and dentition to assess aging

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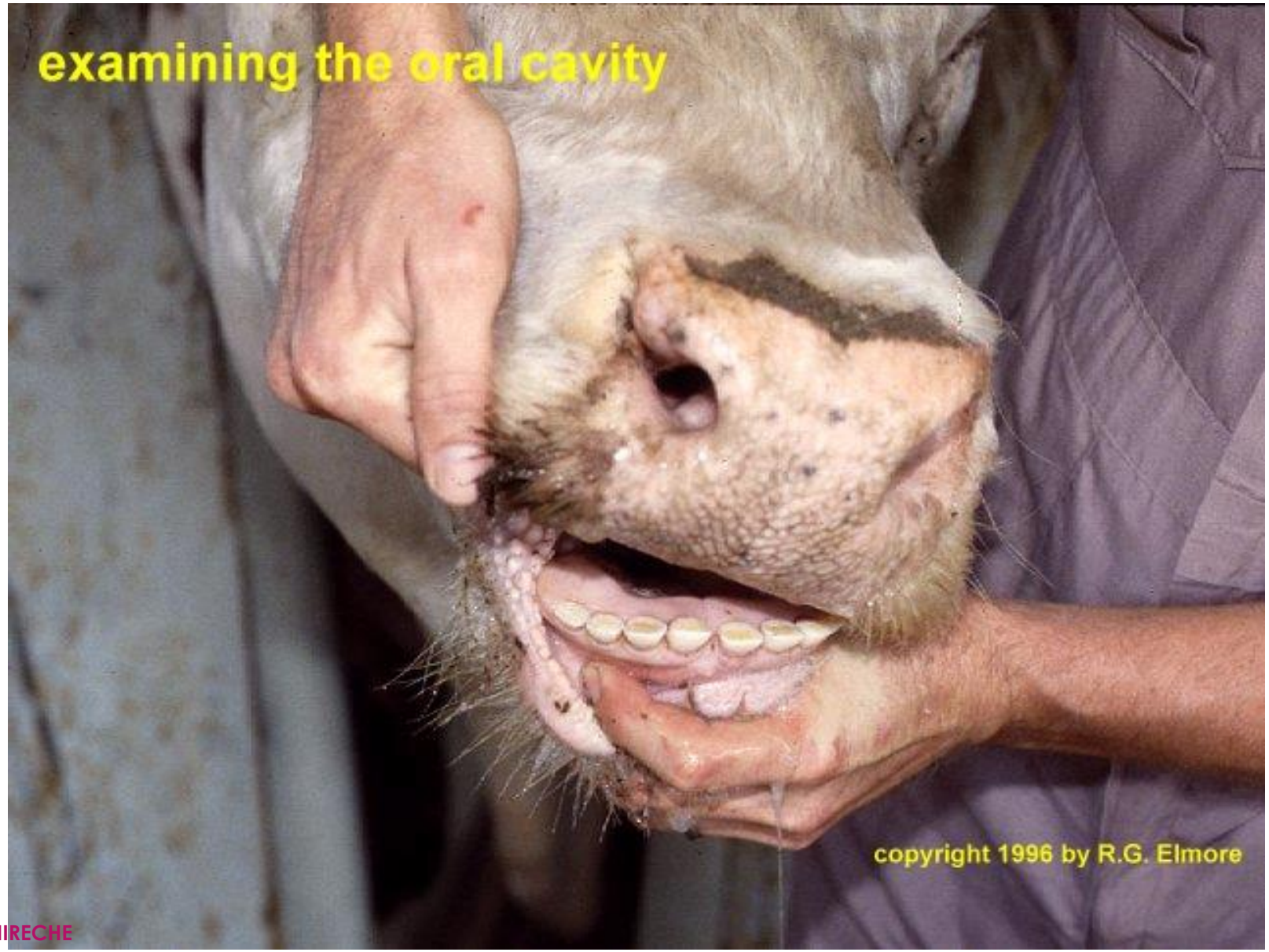
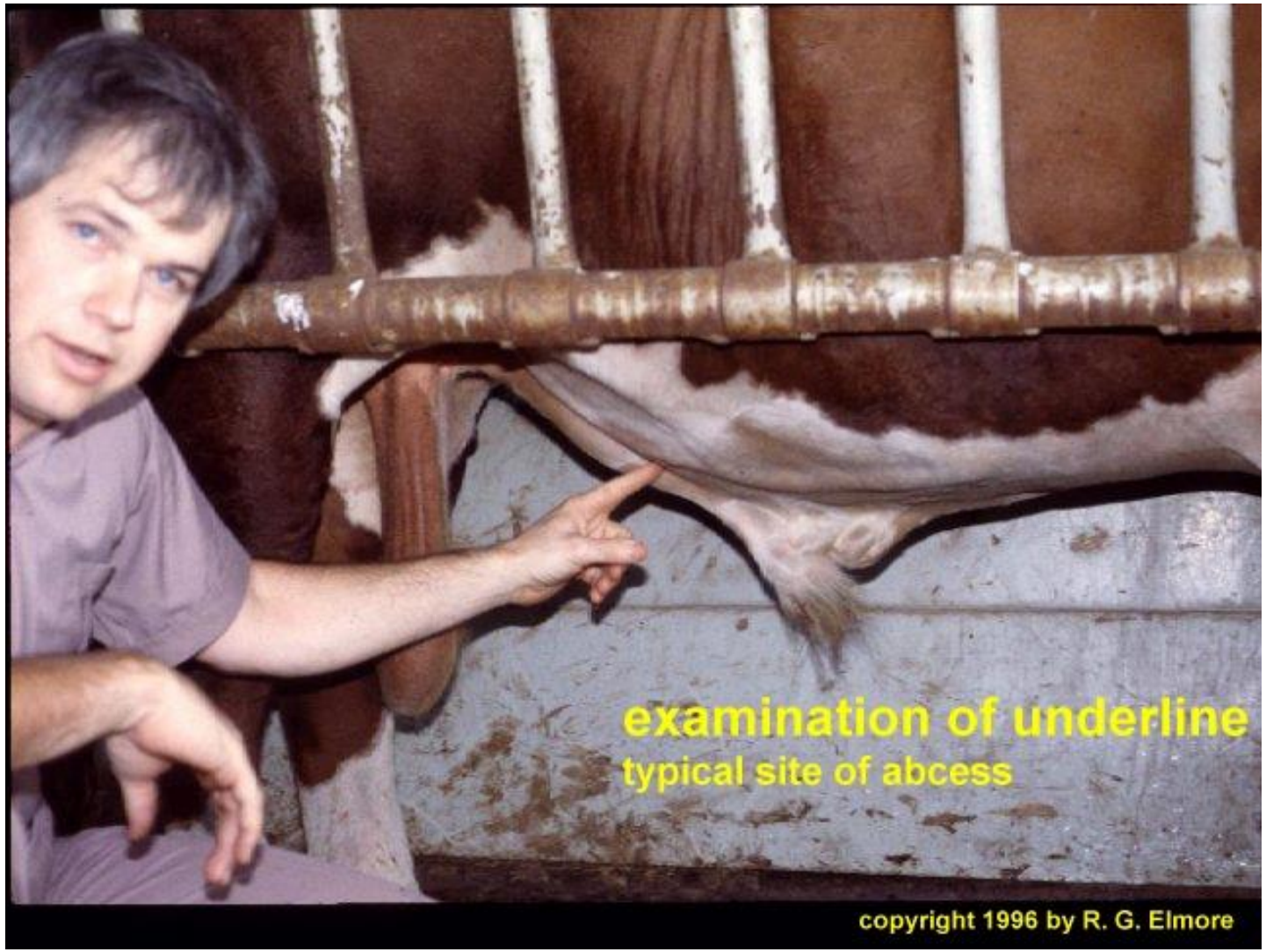
Examination of the oral cavity and dentition to assess aging



Examination of the oral cavity and dentition to assess aging


examination of underline
typical site of abcess
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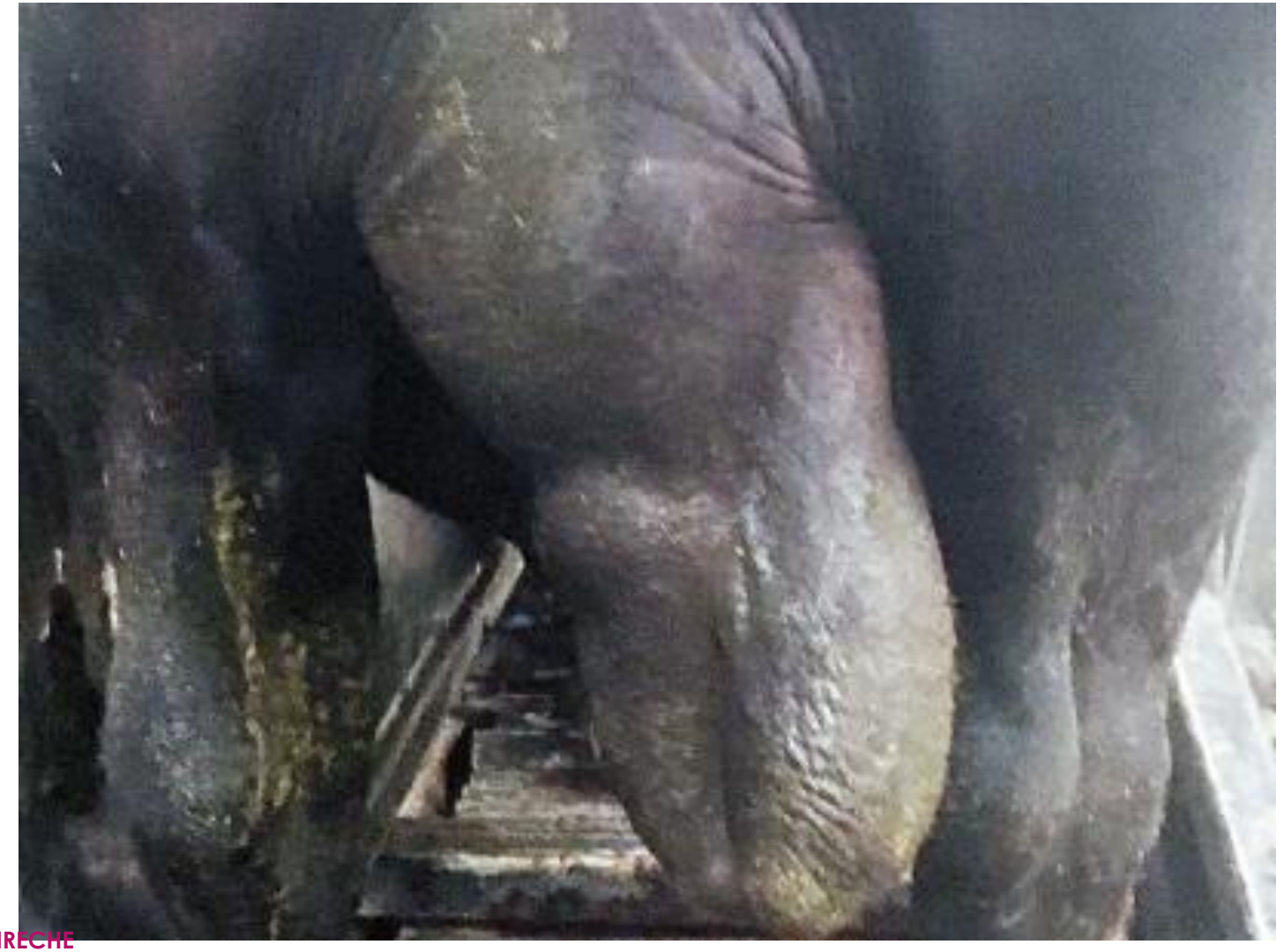
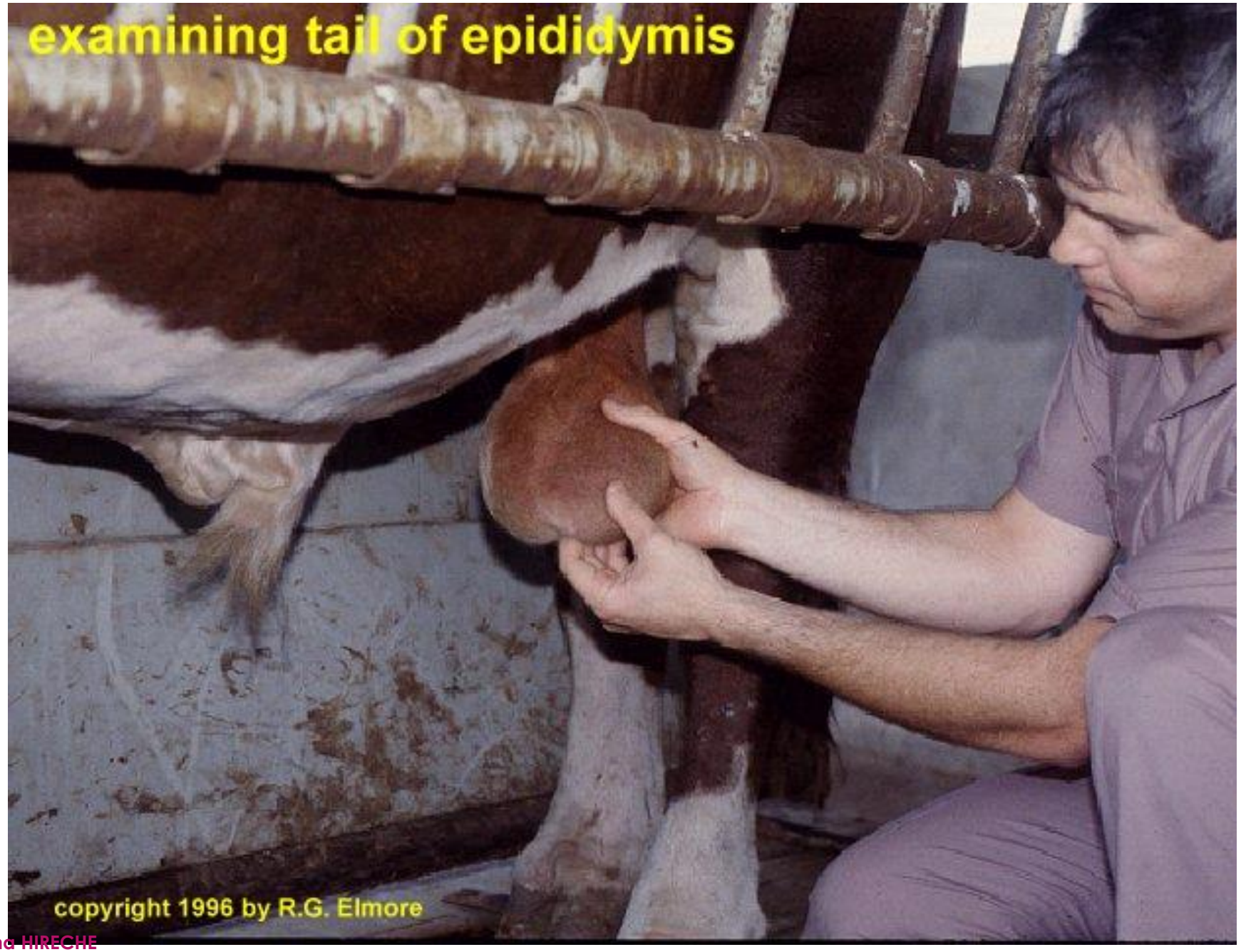
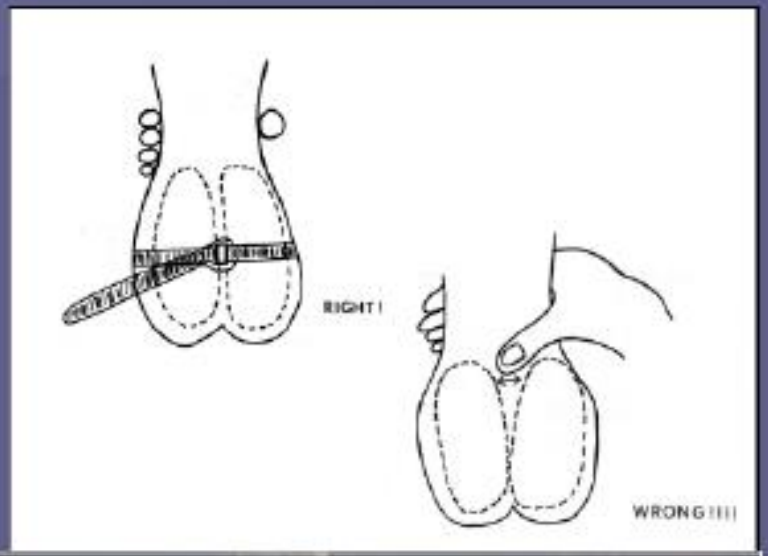
Bull with inguinal hernia.
This bull should be evaluated immediately by a veterinarian

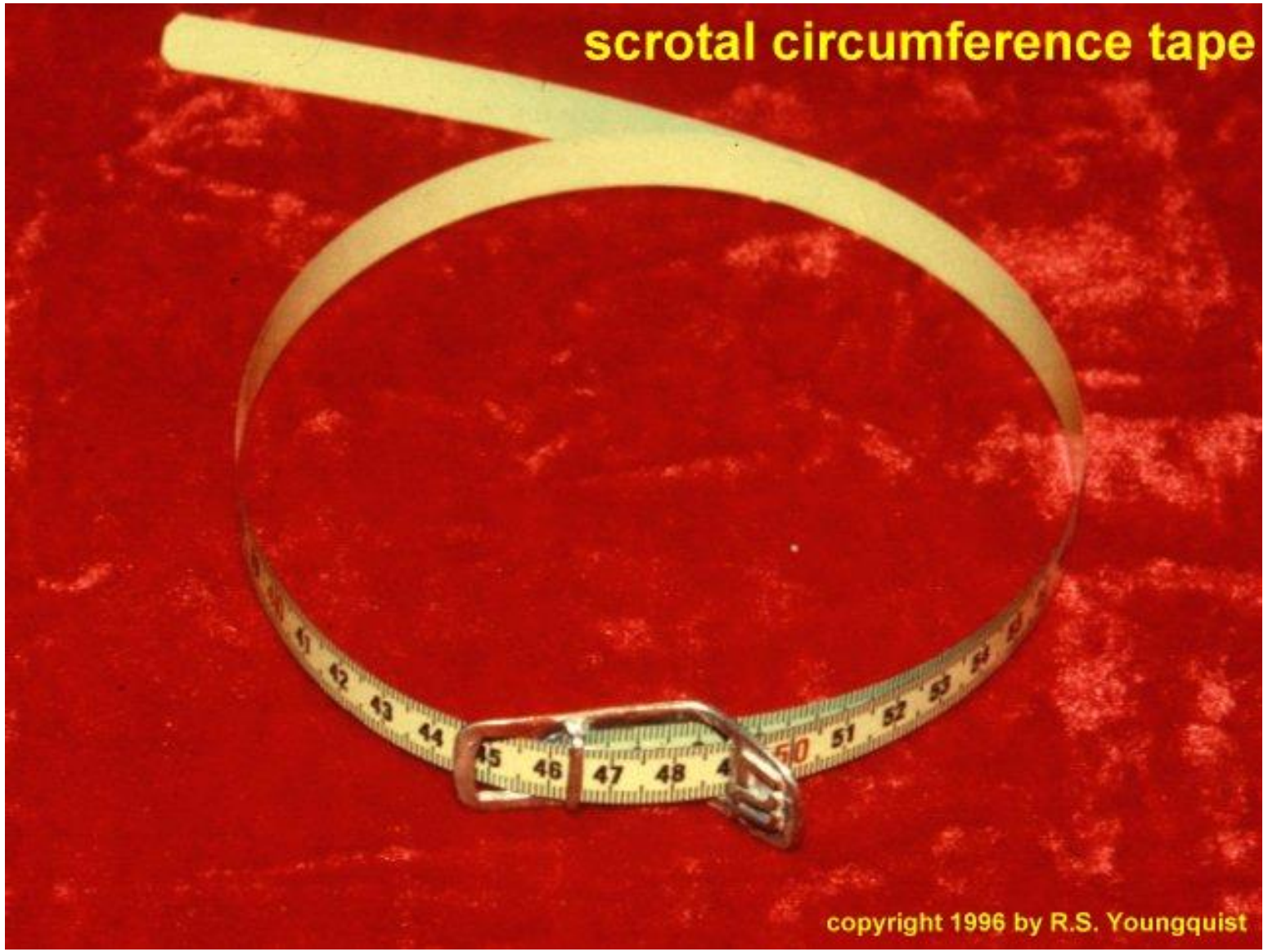



examining tail of epididymis
copyright 1996 by R.G. Elmore

Scrotal Circumference

Minimum Recommended Scrotal Circumference	
Age	SC(CM)
≤ 15 MO	30
> 15 ≤ 18 MO	31
> 18 ≤ 21 MO	32
> 21 ≤ 24 MO	33
> 24 MO	34




scrotal circumference tape
copyright 1996 by R.S. Youngquist

The correct way to measure SC.

The testes are pushed toward the bottom of the scrotum and the scrotal tape is placed at the widest area. The scrotal tape should be pulled tightly.

Scrotal circumference should be measured
at the widest point and pulled tight to allow for accurate measurement


correct placement of
scrotal circumference tape
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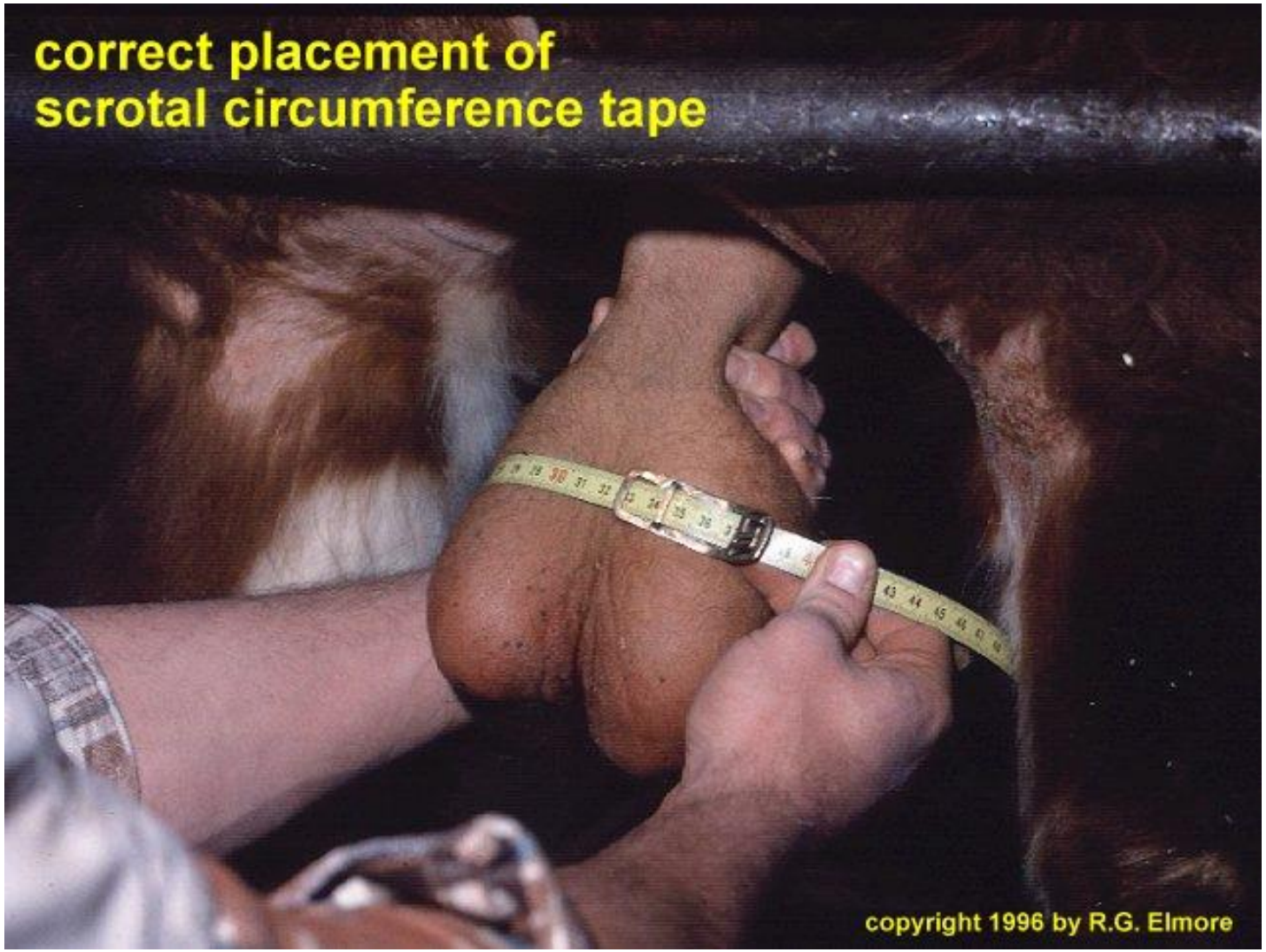
correct placement of
scrotal circumference tape
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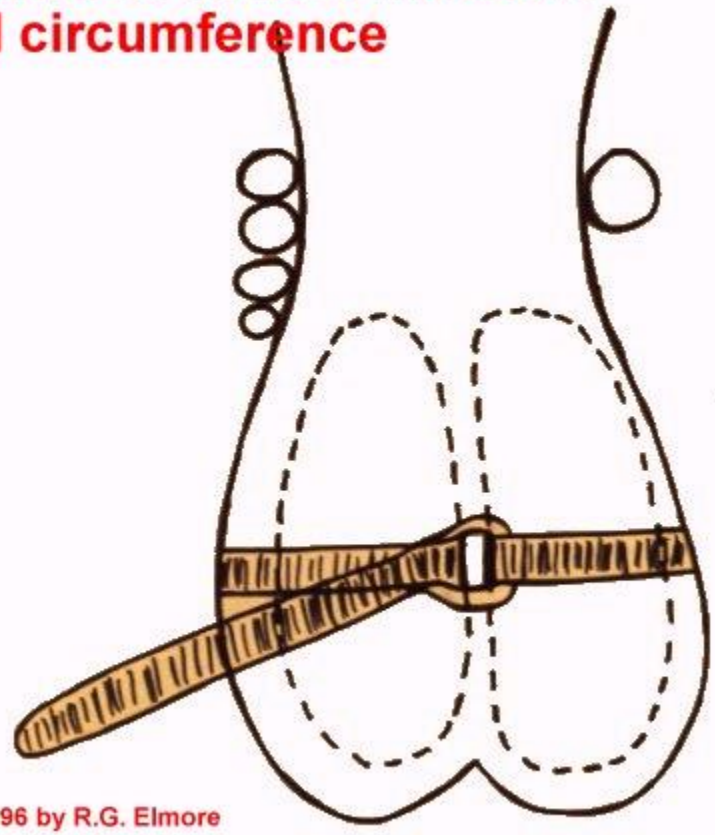
placement of hand to measure scrotal circumference



RIGHT !

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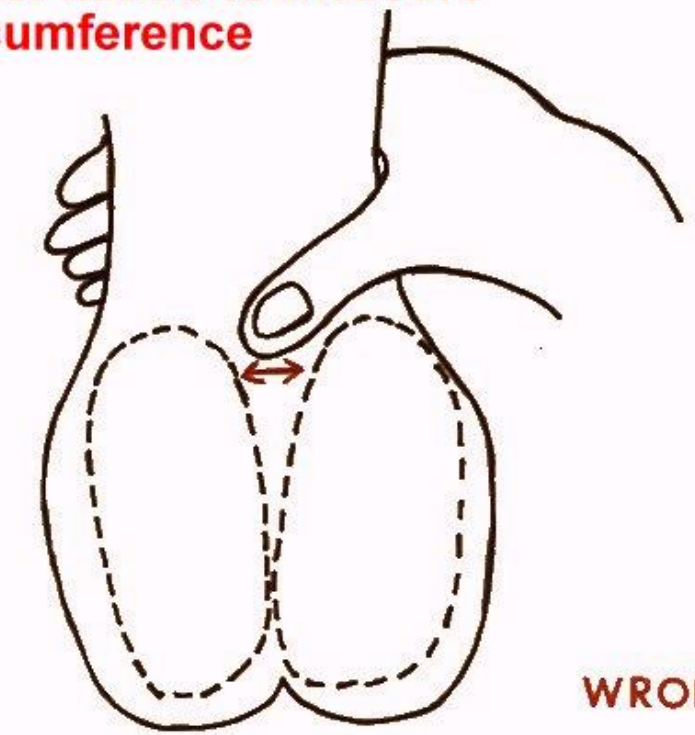
placement of hands to measure scrotal circumference



WRONG !!!!

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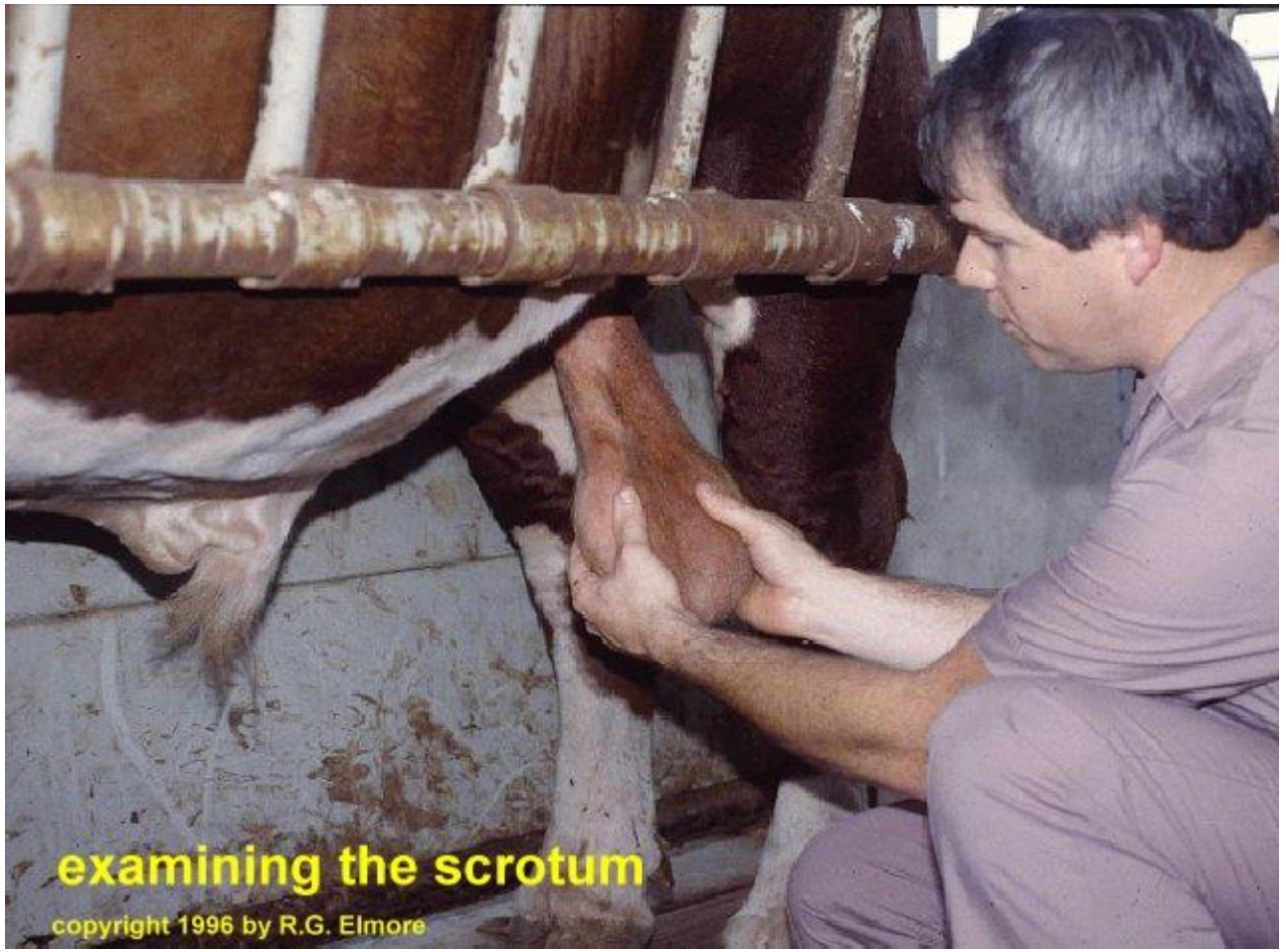
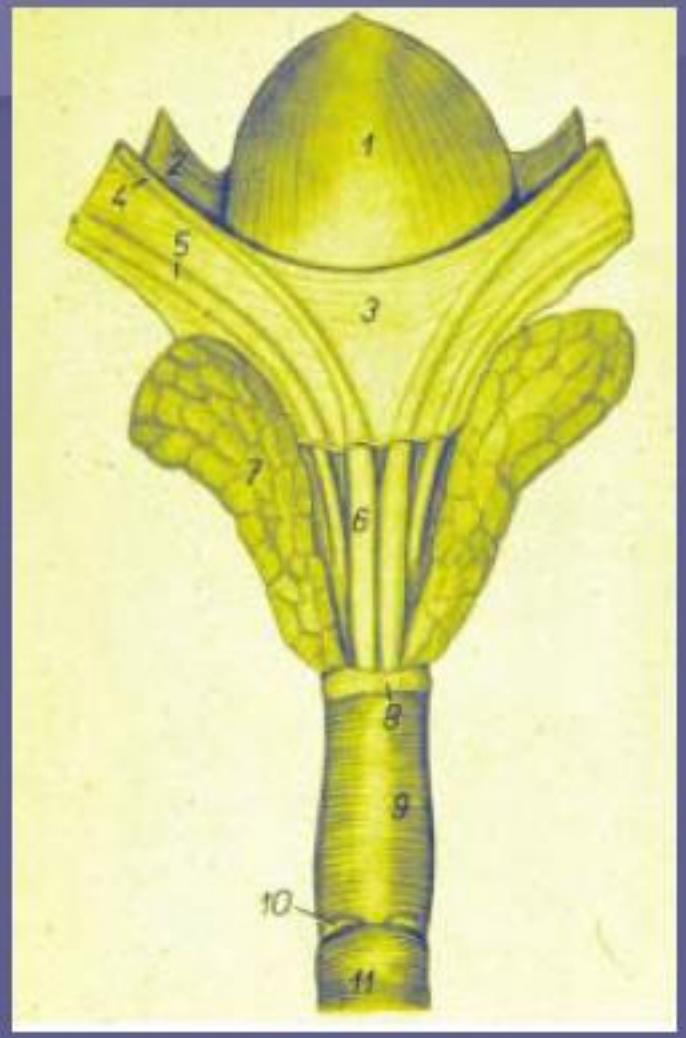

examining the scrotum
copyright 1996 by R.G. Elmore

Transrectal palpation to evaluate the internal reproductive tract and prepare the bull for electroejaculation

Internal genitalia



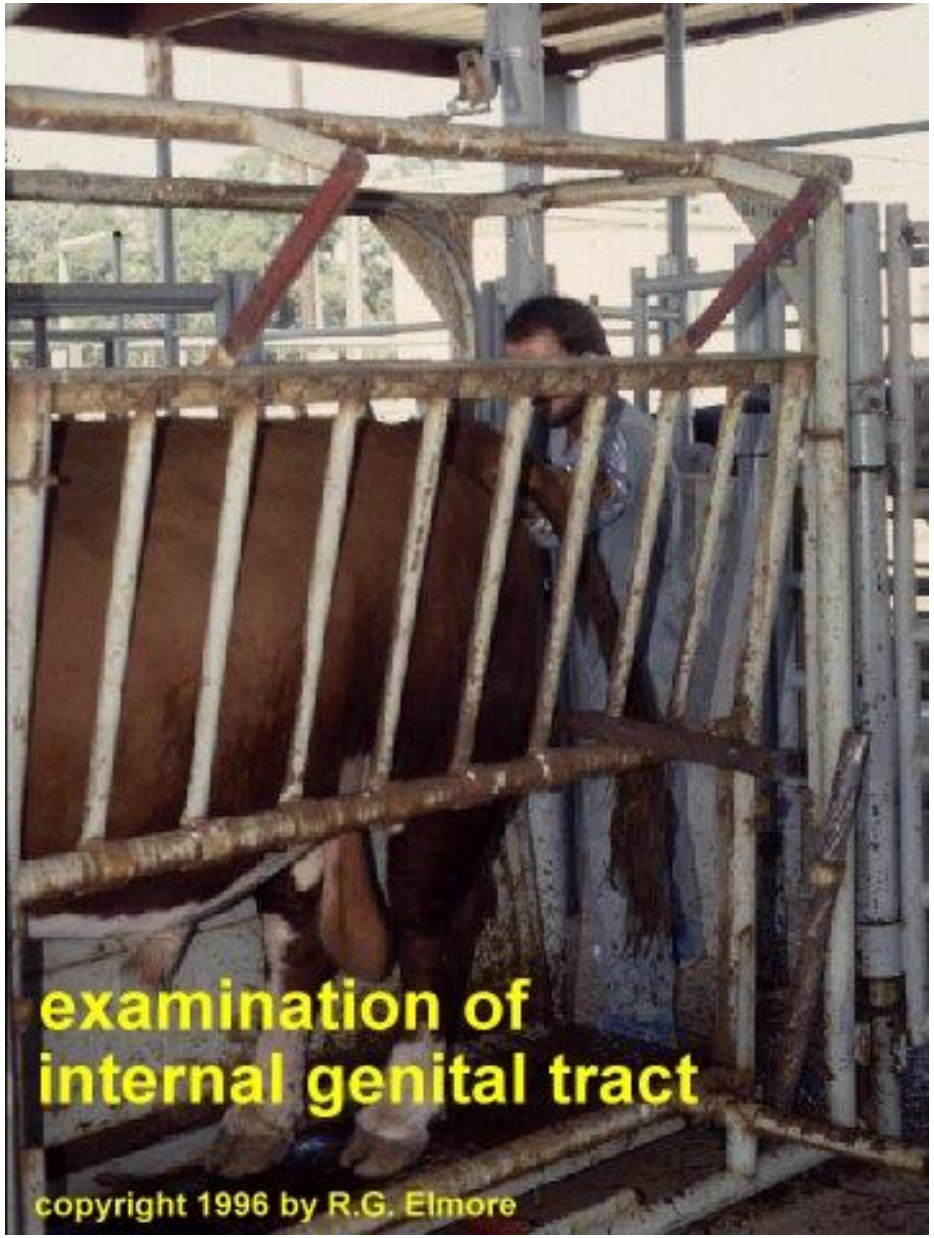
Rectal Examination:

- Prostate Gland (8)
- Seminal vesicles (7)
- Cowper's Gland (10)
- Ampulla (6)

→ Size
→ Symmetry
→ Width
→ Consistency
→ Pain on palpation

- Inguinal Rings

Semen Collection


examination of
internal genital tract
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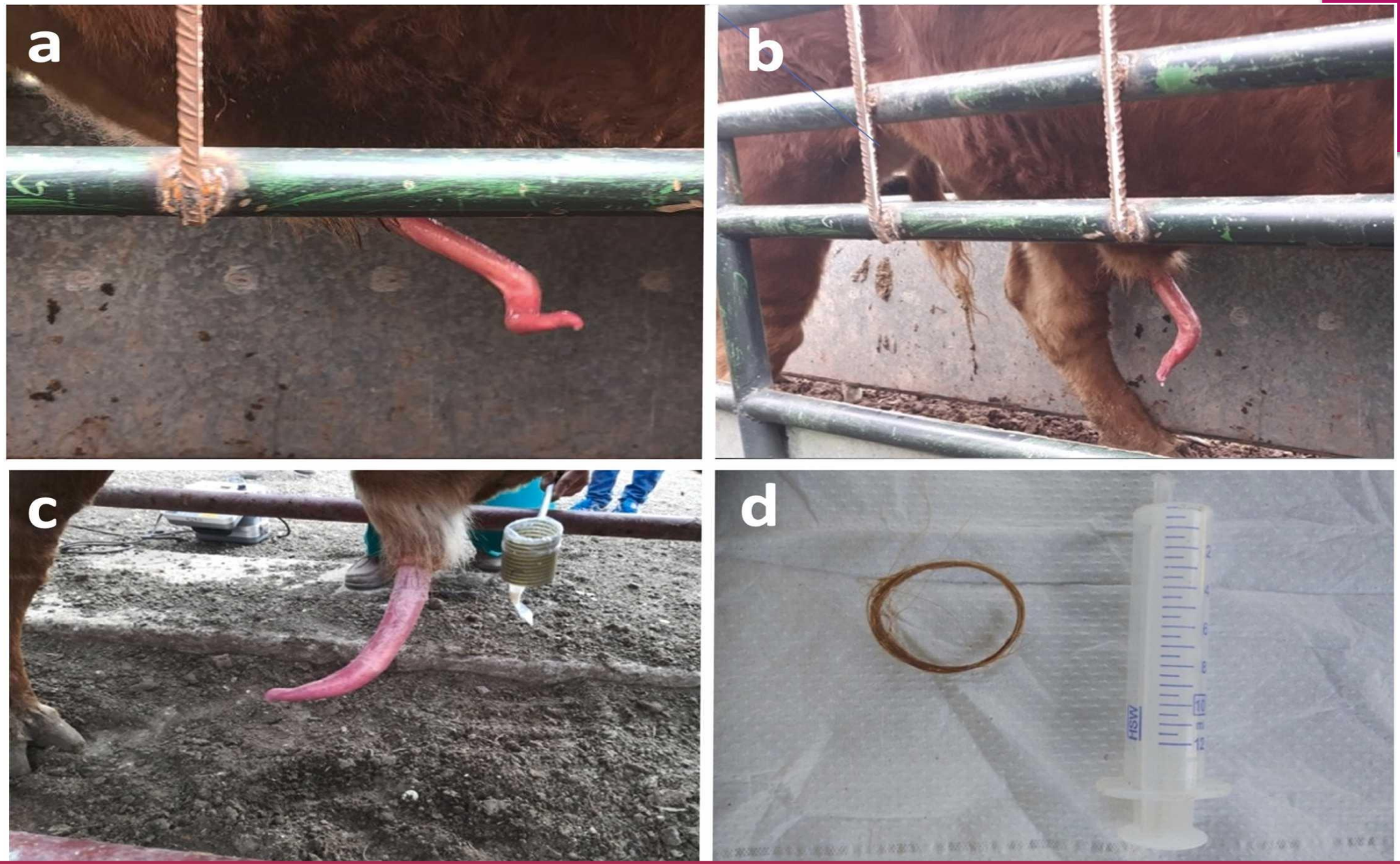
POOR PREPUTIAL CONFORMATION

GOOD PREPUTIAL CONFORMATION

PENIS PROBLEMS

- An adequate length for a bull's penis is that it should come almost between the front legs during a full erection and extension.
- A bull with a too short penis will not be able to breed.
- Other penile problems such as deviations of corkscrew, rainbow, or lateral deviations should be noted and will cause a bull to fail a BSE.
- A fibropapilloma on the bull's penis may cause hemorrhage during breeding, and result in infertility.

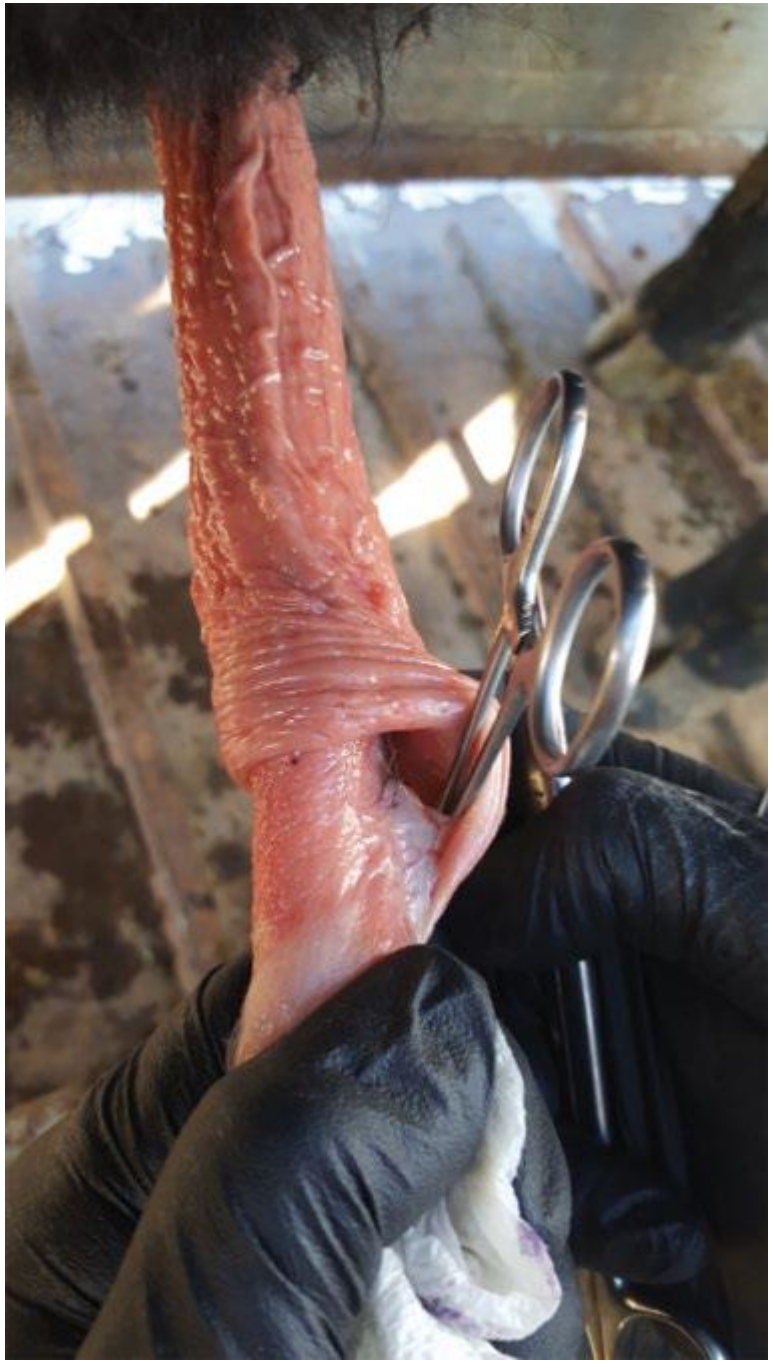


Images from anatomical penis defects detected during the electro ejaculation procedure. a, b. Spiral deviation. c. Ventral deviation. d. Penile hair ring (Pérez-Marín et al 2026)

PERSISTENT FRENULUM

The presence of the persistent frenulum was noted at the time of a post-purchase breeding soundness examination.

A satisfactory pre-purchase “semen test” had been provided at the time of sale, emphasizing the importance of examination of the external genitalia during a bull breeding soundness examination.



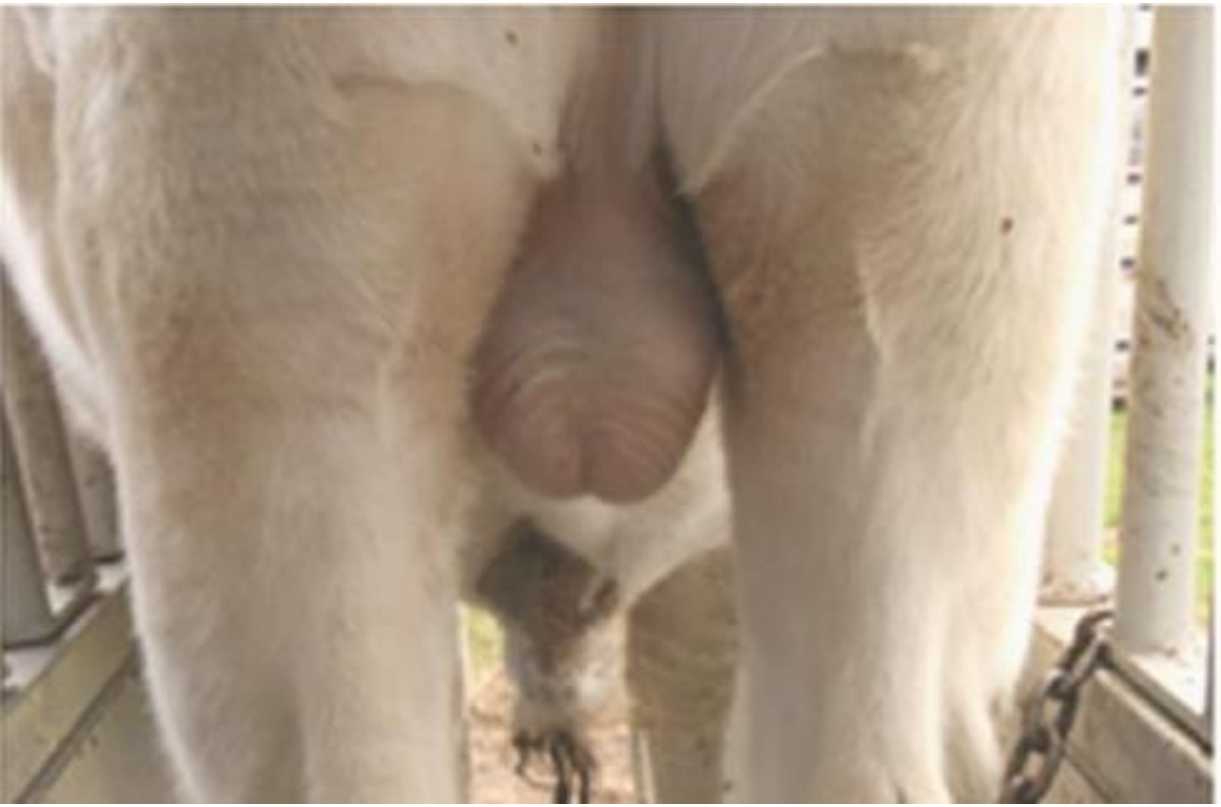
Source: Dr. Clint Hilt.

Examination of the Reproductive System

- The scrotum, testes, and spermatic cord should be examined carefully for fluid, fibrotic tissue, size, symmetry, shape, and texture.
- The scrotum should be examined for scars and its ability to extend or stretch to allow the testicles to cool.

Examination of the Reproductive System

- The testes should be palpated and have the texture of meat and be freely moveable within the scrotum.
- Any fibrotic or swollen areas should be noted.



Examination of the Reproductive System

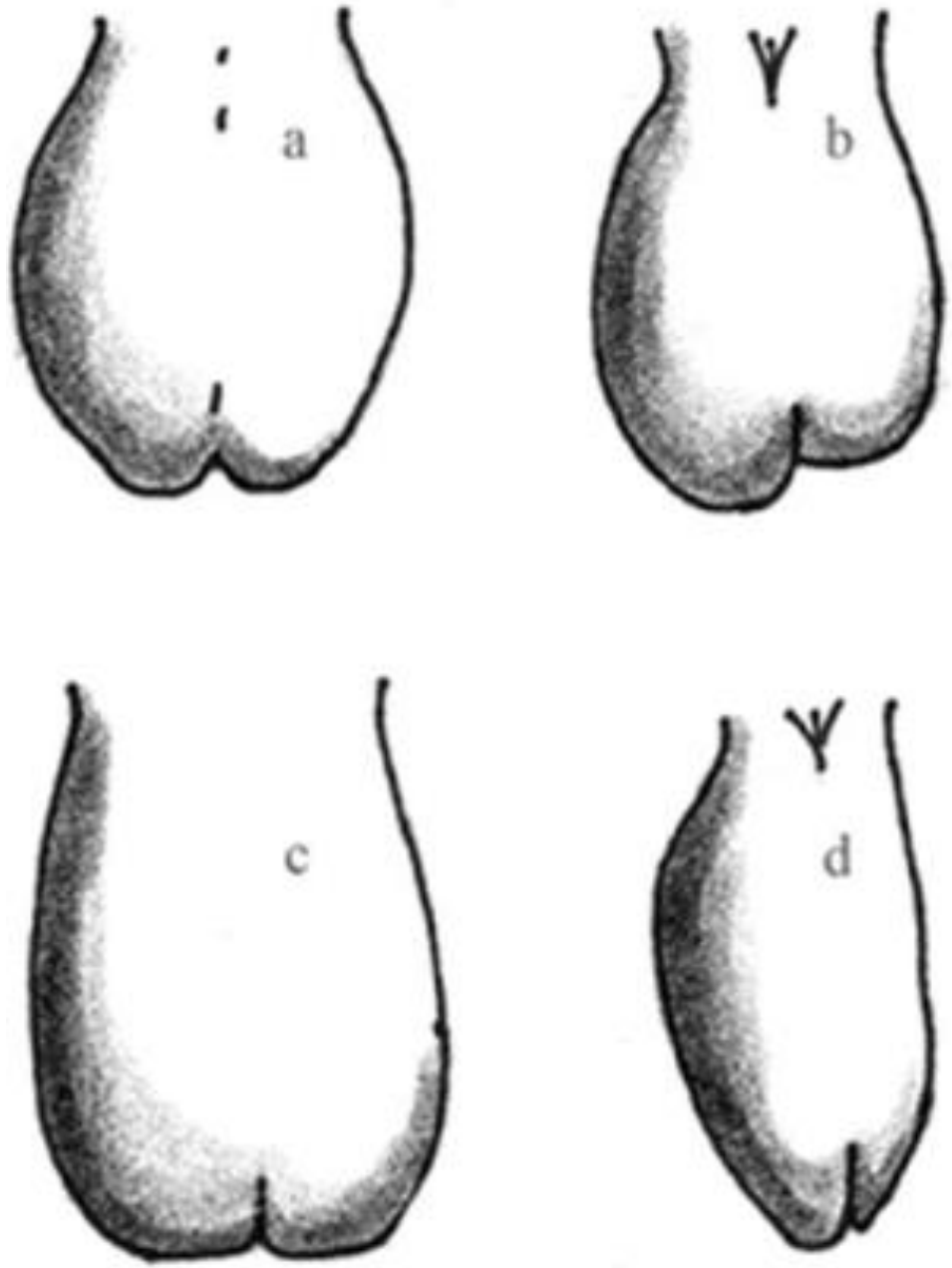
- The epididymides should be palpated from the head dorsally, down the body, ventrally to the tail, for abnormalities such as epididymitis or fibrosis.
- The spermatic cord is palpated from the external inguinal ring distal to the testicle for abnormalities such as hernias, hematomas, fibrosis, or fluid.

Examination of the Reproductive System

- The external prepuce should be observed and palpated for abscesses and swellings, as well as hematoma of the penis directly anterior to the scrotum.
- Problems identified during scrotal examination can include scrotal skin lesions such as frostbite, dermatitis, scrotal edema, and blood warts.

Examination of the Reproductive System

- There are several normal variations of scrotal shape and testicular positioning within the scrotum.
- Thus, the presence of hydroceles and hematoceles as well as inguinal hernias must be ruled out in bulls with aberrances in scrotal size and shape.


a
b
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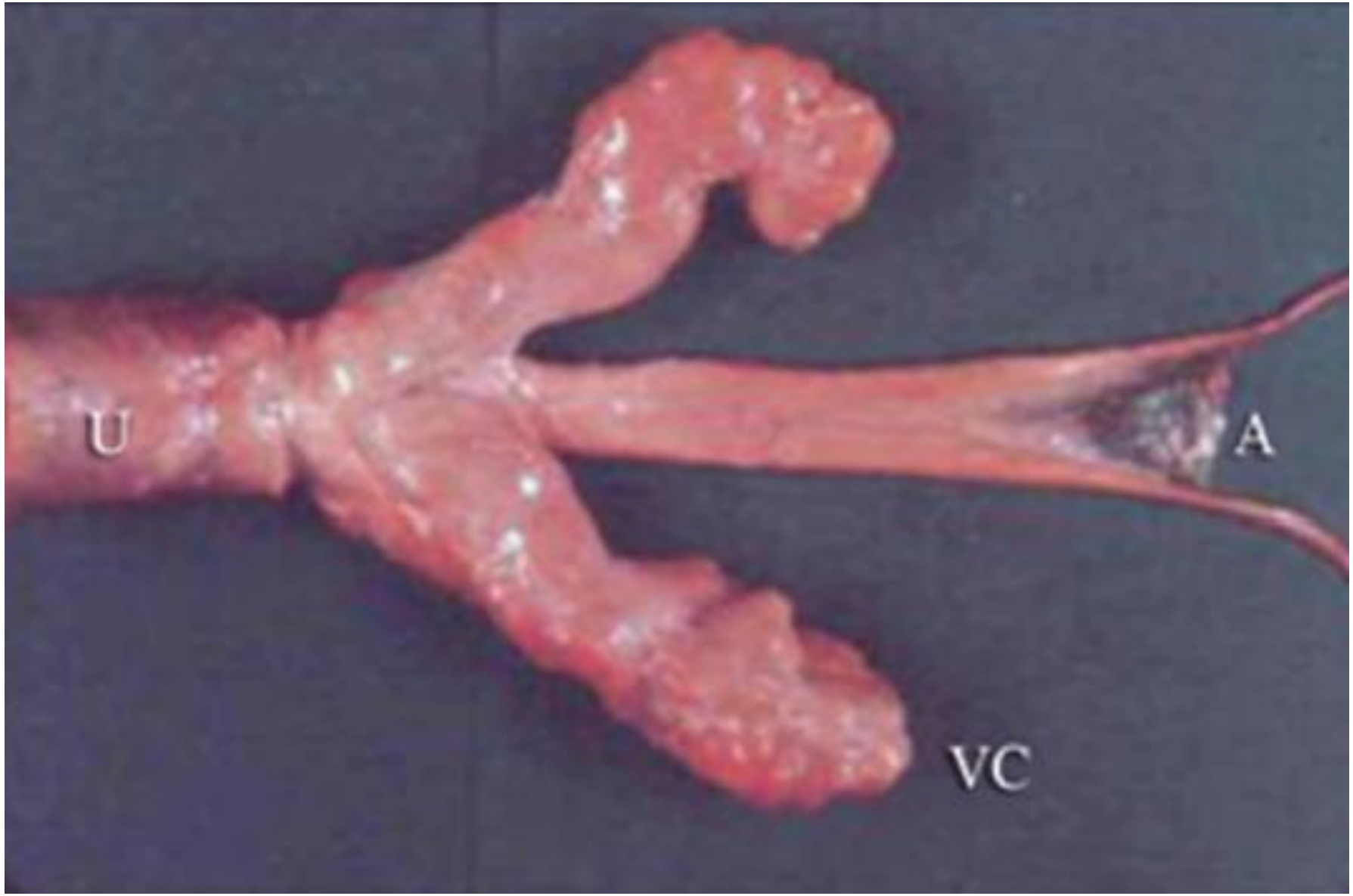
Examination of the Reproductive System

- Ancillary testing utilizing ultrasound or thermography, although usually not necessary to classify a bull by the SFT standards, can be useful to further investigate abnormalities discovered during the physical examination

Internal reproductive examination

- It is utilized to evaluate the internal reproductive genitalia and can be aided or enhanced with the use of ultrasound.
- Each of the secondary sex organs should be carefully identified and palpated for any changes from the normal.

FIGURE 3.2 Ultrasound testicle examination: In sagittal view location of the probe is parallel to the long axis of the testicle. Also, it allows the evaluation of the parenchyma of both testicles.


U
A
VC

Internal reproductive examination

- The urethralis muscle is the first to be encountered and should be palpated for abscesses and tumors.
- As you palpate forward, the prostate and seminal vesicles (vesicular glands) are encountered.

Internal reproductive examination

- Palpation of both vesicular glands should begin at the bifurcation with the vesicle surrounded by the hand as it is palpated toward and to each distal endpoint.
- Texture, size, the presence of heat or pain, and distinction of the lobulations should be noted.

Internal reproductive examination

- Vesicular adenitis is one of the most common abnormalities suggested by the internal reproductive examination.
- Evidence of previous infection or injuries to the seminal vesicles can also be diagnosed by the presence of fibrosis and adhesions.

Internal reproductive examination

- The paired ampullae should be examined next for abnormalities as well as gently massaged to aid in semen collection.
- The examiner should use the transrectal examination as an opportunity to palpate the internal inguinal rings for size and the presence of hernias.

Bull Palpation

- The prostate is palpated as a band that crosses the pelvic urethra.
- There are no diseases associated with the prostate, but it is a useful landmark.
- The ampullae is the distal portion of the ductus deferens that connect to the pelvic urethra. There are generally no problems with this accessory sex gland.

Bull Palpation

- The seminal vesicles are paired glands that feel like a bag of grapes on either side of the pelvic urethra.
- Seminal vesiculitis is a fairly common disease of bulls.
- Any asymmetry or pain associated with palpation is an indication that vesiculitis may be present.

Bull palpation

- The inguinal rings should be palpated.
  - They are normally about a hand's width off the midline and a hand's length over the brim of the pelvis.
- You can usually just get your fingers into the rings. If the rings are large, or a loop of intestines is going through the rings, the bull may have problems in the future.

Internal reproductive examination

- The caudal abdomen should also be palpated for the presence of enlarged lymph nodes that could be suggestive of infection or neoplasia of the reproductive genitalia

Penis and Internal Prepuce

- The penis has already been palpated during the examination of the external prepuce but must be carefully examined and palpated while extended during the collection stage of the BBSE.

Penis and Internal Prepuce

- Problems such as warts, hair rings, lacerations, and persistent frenulum will be discovered at this point.
- The internal prepuce presents itself for thorough examination during erection, allowing the opportunity to observe lacerations, warts, and fibrotic areas from old injuries that may cause deviations of the penis preventing coitus.

Penis and Internal Prepuce

- The internal prepuce presents itself for thorough examination during erection, allowing the opportunity to observe lacerations, warts, and fibrotic areas from old injuries that may cause deviations of the penis preventing coitus.

Penis and Internal Prepuce

- The necessity of completely extending the penis at some point of the examination cannot be overemphasized as the previously mentioned conditions will be missed if this is not done.

Example of an Examination Protocol

- The examination begins with a history and examination at a distance.
- Evaluate conformation and be certain to record observations and identification of those bulls that have issues.

Example of an Examination Protocol

- Watching each bull approach the chute is a good time to observe the gait of the bull and overall appearance.
- Once in the chute, the bull's identification (tag, tattoo, or brand ID), eyes, head, and front claws are observed and observations recorded.

Example of an Examination Protocol

- From the side of the bull, the testicles are palpated and SC measured, the prepuce is palpated for abnormalities, and the hind feet are observed.
  - At this point the scrotal measurement and any observations are recorded.

Example of an Examination Protocol

- The rear of the bull is then approached and the back, hind legs, and especially the hock joints are observed and/or palpated.

Example of an Examination Protocol

- Transrectal palpation is then performed, again using a constant sequence.
- In the pelvic area, the urethralis muscle is followed forward to the seminal vesicles, which are palpated and massaged

Example of an Examination Protocol

- The fornix of the seminal vesicles is located, and the ampullae are palpated and massaged, as are the inguinal rings, pelvic lymph nodes, the kidney, and any viscera within reach.
- The ampullae and the seminal vesicles are then massaged again.
- The urethralis muscle and the prostate are identified and

Example of an Examination Protocol

- The fornix of the seminal vesicles is located, and the ampullae are palpated and massaged, as are the inguinal rings, pelvic lymph nodes, the kidney, and any viscera within reach.
- The ampullae and the seminal vesicles are then massaged again.

Example of an Examination Protocol

- The urethralis muscle and the prostate are identified and massaged while progressing toward the anus.
- In addition to identifying abnormalities or eliciting a painful response, which may indicate a problem, palpation and massage serves to stimulate the bull and facilitate ejaculation.

Example of an Examination Protocol

- Thereafter, the electroejaculator is placed on the standard program and the probe is inserted into the rectum.
- At this point any observation or abnormalities from palpation are recorded.

Example of an Examination Protocol

- As erection and protrusion occur, the internal prepuce and the penis are examined by observation and palpation for abnormalities.
- After microscopic examination of the semen has been done, the bull is then released from the chute.

Example of an Examination Protocol

- The bull is observed leaving the chute and the chute area for lameness.
- It is of utmost importance that a standard protocol be developed to ensure that all areas of the physical examination and SC are checked and recorded

Scrotal circumference

- The SC measurement is obtained while doing the general and reproductive examination.
- It can be obtained from the side or the rear, depending on preference, facilities, and the bull's temperament.

Scrotal circumference

- After gently forcing both testes to the bottom of the scrotum, the primary considerations are to avoid spreading the testes apart and to ensure sufficient pressure that the top surface of the measuring tape is level with the skin.
- Record the measurement at this point.

Scrotal circumference

- If the circumference is below the minimum requirement, there is no need to continue the examination.
- Young bulls or emaciated bulls may receive a deferred classification in some cases.

Scrotal circumference

- The SFT minimum thresholds for SC are listed below:
  - 30 cm at <15 months.
  - 31 cm at >15 to 18 months.
  - 32 cm at >18 to 21 months.
  - 33 cm at >21 to 24 months.
  - 34 cm at >24 months.

Example of an Examination Protocol

- Identification of the bull is essential.
- Obviously a ear tattoo is better than ear tags for positive identification.
- If you have a controversial case, take a photograph.

Example of an Examination Protocol

- A physical exam is important in determining if a bull will be able to adequately breed.
- A bull's body condition must be good at the BSE, because a bull will lose condition during the breeding season.

Example of an Examination Protocol

- If he starts too thin, he may not be in good enough condition later on to breed cows.
- The bull's locomotion system must be good as he needs to get to cows to breed them.

Example of an Examination Protocol

- Poor conformation can contribute to lameness, which obviously contribute to breeding problems.

Example of an Examination Protocol

- Test the bull's vision, as bulls identify estrual cows by sight, not by smell.
- If a bull cannot see, he will not find the cows in estrus.

Example of an Examination Protocol

- Look at the teeth.
- A bull needs to eat in order to stay fit enough to breed.
- You can also age a bull by his teeth.

Example of an Examination Protocol

- Look carefully at the sheath for its conformation.
- It should basically point at the ground between the bull's front feet (except for the last bit on the tip).
- Check it carefully for an abscess, eversion, or prolapse.
  - If these conditions appear during a BSE, the bull will probably not last the breeding season.

Penis

- When the bull is being ejaculated, make sure he can fully extend his penis.
- Phimosis is when the bull cannot get the penis out, and paraphimosis is when the bull cannot get the penis in.

Penis

- During ejaculation check for a persistent frenulum.
  - This occurs when the prepuce remains attached to the glans penis.
  - It may be a heritable condition, so it is best not to keep bulls that have it.

Testes

- The testes should be examined for carriage, consistency and size.
- The shape of the scrotum is important for thermoregulation of the testes.

Testes

- A‘neck’ should be present in the scrotum, but abnormal shapes include scrotums that are pointed or straight sided.
- The testes should be freely moveable within the scrotum and the testes should be symmetric.

Testes

- The testes may rotate 40 degrees normally and the ‘scrotal ligament’ may cause the testes to be pulled dorsal and caudal, but this has little apparent affect on fertility.
- Any testicular asymmetry is abnormal and may indicate orchitis, testicular degeneration, hydrocele, or hernia.

Testes

- The testes should have the consistency of a flexed biceps muscle.
- The size of the testes is correlated with sperm production in the bull and age of puberty in the offspring.

Testes

- It is also important to palpate the epididymis to ensure that it is present and it is normal.

Testes

- Scrotal circumference is an indirect measure of testicular mass, it is associated with sperm production, and it is associated with parenchymal health of the testicular tissues.

Testes

- Bulls with small testes produce less sperm, have a later puberty in their daughters and sons and have earlier testicular degeneration