

EPIDEMIOLOGICAL ASPECTS OF SURGICAL DISEASES OF THE GENITAL TRACT IN A POPULATION OF 12,320 BREEDING BULLS (1982-2007) IN THE STATE OF GOIAS, BRAZIL

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ABSTRACT

The genital tract of bulls might be affected by diseases that result in *coeundi* impotence leading to decrease of reproductive efficiency. Anatomic, breed and handling aspects are considered predisponent factors to genital injuries. In this study, it was considered 12,320 bulls evaluated between 1982 and 2007. From these, 898 (7.29%) bulls had some reproductive tract disease corrected surgically, diagnosed by specific clinical examination of the genitalia or service capacity test. At the same time, questionnaire was applied in order to obtain information related to genital diseases epidemiology. From 898 ill bulls, 741 (82.52%) were *Bos indicus*, 133 (14.81) were *Bos taurus* and 24 (2.67%) were crossbred bulls. It was observed that

570 (63.50%) were ≥ 60 months-old, 220 (24.5%) were between 40 and 60 months-old and 108 (12.0%) were ≤ 40 months-old. Among the diagnosed diseases, independent of breed, age and handling, it was identified 728 (81%) cases of acropostitis-fimosis, 46 (5.20%) penis deviation, 23 (2.60%) gland fibropapilloma, 14 (1.60%) preputial abscesses and 11 (1.20%) penile fractures. From 417 visited farms, 256 (61.50%) treated the disease empirically, ignoring previous diagnosis. Thus, it can be concluded that handling and breed characteristics were the main predisposing factors related for the etiopathogeny of reproductive tract diseases.

KEY WORDS: Bovine, epidemiology, reproduction.

RESUMO

ASPECTOS EPIDEMIOLÓGICOS DE ENFERMIDADES CIRÚRGICAS DO APARELHO GENITAL DE TOUROS EM UMA POPULAÇÃO DE 12.320 REPRODUTORES (1982-2007) NO ESTADO DE GOIÁS, BRASIL

O aparelho genital do touro pode ser acometido por enfermidades que resultam em impotência *coeundi*, levando à queda na eficiência reprodutiva. Aspectos anatômicos, raciais e manejo são considerados fatores predisponentes de injúrias à genitália. Neste estudo, catalogaram-se 12.320 touros entre 1982 e 2007, sendo que, destes, 898

(7,29%) eram portadores de alguma enfermidade cirúrgica no aparelho reprodutor, diagnosticados pelo exame clínico específico da genitália ou por meio do teste de capacidade de serviço. Concomitantemente, aplicou-se questionário para obtenção de informações relacionadas à epidemiologia das enfermidades genitais. Dos 898 touros enfermos,

741 (82,52%) eram zebuínos, 133 (14,81%) taurinos e 24 (2,67%) mestiços. Observou-se que 570 (63,5%) possuíam idade igual ou superior a 60 meses, 220 (24,5%) entre 40 e 60; e 108 (12,0%) inferior a 40 meses. Dentre as enfermidades diagnosticadas, registraram-se 728 (81%) casos de acropostite-fimose, 46 (5,20%) desvios penianos, 23 (2,60%) fibropapiloma de glândula, 14 (1,60%) abscessos

prepuçiais e 11 (1,20%) fraturas penianas. Dos 417 produtores rurais visitados, 256 (61,50%) efetuavam, empiricamente, tratamento das enfermidades, ignorando a importância do diagnóstico. Concluiu-se que o manejo e a característica racial foram os principais fatores predisponentes relacionados à etiopatogenia das enfermidades do aparelho reprodutor.

PALAVRAS-CHAVES: Bovino, epidemiologia, reprodução.

INTRODUCTION

The genital tract of bulls may be affected by diseases which lead to deficiency of sperm production (*impotentia generandi*), difficulty or inability to copulate and loss of libido (*impotentia coeundi*). These events result in low herd reproductive efficiency, causing damage mainly in extensive productive systems. Although the *impotentia coeundi* has not been frequently studied, HAFEZ (2004) pointed out that the decrease or loss of libido or ability to copulate are the main forms of bull infertility.

According to MEMON et al. (1988), DESROCHERS et al. (1995) and RABELO et al. (2006), pendulous prepuce and internal preputial sheath, a wide preputial orifice and agenesis or atrophy of the penis retractor muscle are considered to be predisposing factors related to the mechanism of male bovine genital diseases. PARKER et al. (1987) reported that the etiology of various injuries, mainly traumatics, of the bull reproductive tract, has been established. However, some epidemiological aspects need to be explained and require further research. Among the recently explained factors, the abovementioned demonstrated that handling and breed characteristics of bovines are relevant to the occurrence of male genital diseases.

Despite the relevance of epidemiological data for the understanding and control of diseases responsible for genital tract injuries in bulls, there is little up-to-date information of about it in either regional or national literature. Moreover, according to TROCÓNIZ et al. (1991) and FRENEAU & GUIMARÃES (2000), new studies deal mainly with questions related to *impotentia generandi* in male bovines and give less importance copulation

as an important component of bull reproductive performance.

WALKER (1984) and KAMILOGLU et al. (2004) evaluated data concerning preputial and penile disorders affecting bulls on rural Turkish properties between 2000 and 2003. They showed the prevalence of certain diseases, the most affected breeds, prevention measure and the economic impact of these diseases on production systems. Besides epidemiology, WALKER (1984) also emphasized the importance of phases associated with copulation in subsidiary diagnosis. This study, carried out on North American herds, established that it is essential to observe of precoitus, preparation, service, trial, penis intromission and ejaculation to clearly understand the genital problems in breeding bulls.

Thus, the objective of this study is to provide a retrospective diagnosis and evaluate epidemiological aspects of surgically-treated external genitalia disorders of bulls of different breeds and ages in the state of Goiás in a population of 12,320 male bovines between 1982 and 2007.

MATERIAL AND METHODS

This study was carried out between 1982 and 2007 on 417 farms in the state of Goiás, Brazil. The properties were selected exclusively on the basis of the presence of bulls with external genitalia diseases which made it difficult or impossible for the animals to copulate or led loss of libido. The total herd population on all the farms was 12,320 animals, with 898 showing surgically treatable reproductive tract disease. These animals were from different breeds and their ages varied from 25 to 120 months.

All visits occurred at the request of the owner. The owners' main complaint was the presence of reproductive abnormalities affecting one or more bulls which led to an inability to copulate. The animals were given a general clinical examination followed by a genital examination. Some bulls required loco-regional anesthesia for pudendal and hemorrhoidal nerves desensitization and penis exposition for diagnosis, in accordance with GILBERT (1989) and SILVA et al. (1998).

When these procedures failed, the service capacity test was performed as suggested by SANTOS et al. (2004). This test is based on observation of the bull's sexual behavior in the presence of a female in natural or therapeutically induced estrus as proposed by CHAVES (2002). To induce estrus in a non-pregnant adult female bovine, intramuscular estradiol cypionate (ECP®- Merial Animal Health, Campinas-SP) was used on, at a dosage of 14mg/kg, in a single application. The female was used in the service capacity test from 18 to 24 hours after induction until the observation of the characteristic signs of receptiveness in the bull.

The bulls were tested individually for ten minutes each. The exposure and orientation of the penis during the test, lesions in penile and surrounding tissue, libido and coitus were observed, among others things. When possible, the animals were treated surgically according to TURNER & MCLWRAITH (1985), EURIDES et al. (1996), HOOPER (2004), SILVA et al. (2004), BENTO (2005) and GARNERO & PERUSIA (2006). In untreatable cases, the animals were killed.

In addition, a questionnaire based on THRUSFIELD et al. (2005) was answered by the owner, manager or technical professionals. The main questions were related to breed and age of the sick bulls, the season of the diseases' greatest incidence, pasture characteristics, reproductive handling, evolution of the disease, prevention and treatment, damage to the animal, what happened to sick animals and whether there was adequate technical support in the region to deal with these kinds of diseases.

The data were analyzed using descriptive statistics in the form of graphs and tables based on CURI (1997).

RESULTS AND DISCUSSION

Among the 12,320 bulls considered in this study, 898 (7.9%) showed injuries to external genitalia which interfered with coitus to differing degrees. Similar results were obtained by SAUNDERS & LADDS (1978) in an examination of 968 bulls at slaughterhouses, of which 68 (7.0%) showed lesions on reproductive organs.

The questionnaire revealed that 741 (82.52%) of the animals were zebu, 133 (14.81%) *Bos taurus* and 24 (2.67%) were crossbred (*Bos indicus* x *Bos taurus*). The greatest frequency (54.70%) of lesions in the external genitalia of Zebu bulls was observed in Nellores (405 animals). Gyr, Tabapuã, Brahman, Indubrazil and Guzerath presented, respectively, 265 (35.76%), 29 (3.90%), 18 (2.43%), 15 (2.0%) and 9 (1.21%) sick animals (Figure 1-A). In the *Bos Taurus* group, the highest frequency of lesions (31.58%) was observed in Holsteins (42), followed by Santa Gertrudis, Simentals, and Brown Swiss totaled 26 (19.52%), 15 (11.30%), 11 (8.30%) and 39 (29.30%) sick bulls, respectively (Figure 1-B). In the crossbred group, the highest frequency of injuries (96%) was related in Girolandos (23 bulls).

The higher occurrence of preputial diseases in *Bos indicus* bulls compared to *Bos taurus*, as observed in this study, may be related to anatomical characteristics, such as pendulous prepuce and inner preputial sheath and wide preputial orifice, which are inherited and characteristic of zebu breeds. MEMON et al. (1988), DESROCHERS et al. (1995) and VIU et al. (2002) referred to these characteristics and associated them with the etiology of such diseases as acroposthitis-phimosis and anterior preputial diverticulitis. In addition, the same authors reported that bulls with agenesis or atrophy of the prepuce retractor muscle may show chronic prolapse of the inner preputial sheath, predisposing them to injuries and consequently loss of service capacity. Therefore, it is important to relate these anatomic conditions to the genesis of acroposthitis-phimosis, which would explain the great number of cases observed in this study.

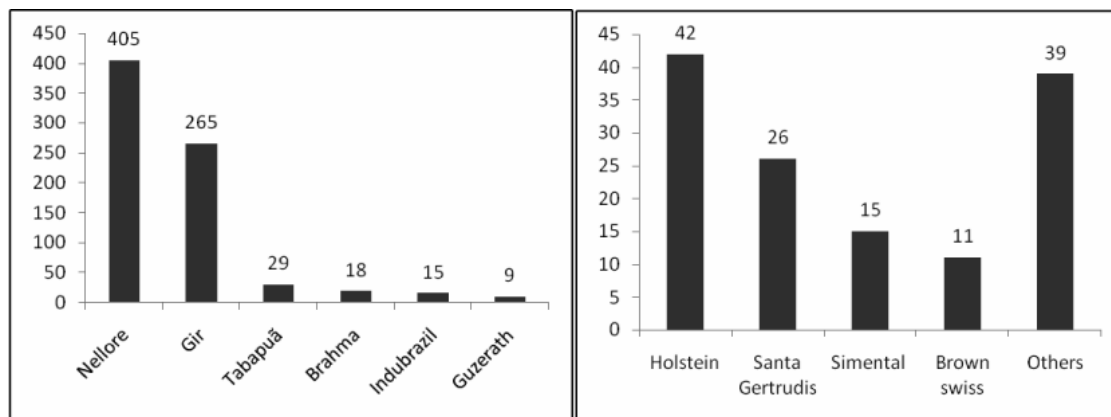


FIGURE 1. Percentages of bull genital tract diseases in 12,320 male bovines among 12,320 male bovines of different breeds - Zebu (A) and *Bos taurus* (B) - on 417 farms in the state of Goias from 1982 to 2007.

Another factor that could be related to the etiopathogeny of genital diseases are poorly maintained or weed-infested pastures that may cause preputial lesions, as observed by RABELO et al. (2006). Besides, according to SILVA et al. (1998), the contact with thorny plants is related to hemorrhagic fistulas and prepuce lesions. However, PARKER et al. (1987) did not observe the relationship between genital lesions and weeds in North American. This fact may be associated to appropriate management of animals and pasture.

The visits to 417 farms and questionnaire analysis established that 388 farms (93.04%) employed natural stud management, with or without a stud farm and without a controlled stud system. On these properties, animal grazing occurred on poorly maintained pastures with an excess of weeds such as “wolf apple” (*Solanum lycocarpum*), “unha de gato” (*Acacia plumosa*) and “malícia” (*Mimosa sensitiva*) among others, as also observed by MARQUES et al. (1988), VAN SAUN & CISZEWSKI (1989) and ISA et al. (2001). These authors added that poor bull prepuce hygiene is an important factor in the occurrence of genital diseases.

As far as age is concerned, 570 (63.5%) of the 898 affected bulls were 60 months old and older, 220 (24.5%) were between 40 and 60 months old and 108 (12.0%) were younger than 40 months old. A similar situation was described by RIET-CORREA et al. (1979), who observed the occurrence of lesions in 80.8% of bulls older

than 36 months. BLOCKEY et al. (1984) noticed spiral-like penis deviation in beef bulls and reported that the prevalence of the disease increased significantly in older breeding bulls.

Independently of genital disease, it was observed that the highest occurrence of injuries was observed at the end of the breeding period. Acro-posthitis-phimosis and penis deviation were the most prevalent of these diseases, affecting 81.5% and 5.2% of the bulls, respectively. In addition, SILVA et al. (1994) reported that controlled breeding or a long breeding periods were related to a large incidence of traumatic events in the course of copula, but did not specify the periods of greatest incidence of bull genital lesions.

The clinical genital examination using local anesthesia for pudendal and hemorrhoidal nerves desensitization proved to be an efficient procedure to diagnose most cases of such diseases as deep phimosis and penile fibropapilloma. In studies of bull genital tract illness in Brazil, SILVA et al. (1998), SIQUEIRA et al. (2000) and RABELO et al. (2006) highlighted the importance for diagnosis of a detailed clinical examination of the reproductive tract. The method of anesthesia employed in this study was recommended by WALKER & VAUGHAN (1980), GILBERT (1989) and GARNERO & PERUSIA (2006) for penis exposition to confirm diagnoses and proved to be efficient and safe.

During this study, in some cases, specific clinical examination did not permit identification

of the type of disease, even after the bull's infertility was noted by the owner. In these cases, it was necessary to use the service capacity test based on SANTOS et al. (2004). This method was effective, since it permitted the diagnosis of bull genital abnormalities not detected during clinical examination. A similar procedure was recommended by MCDIARMID (1981) for detection of penile diseases, mainly in cases of penile deviation and rudimentary penis, which explains its use in this study.

Six of the diseases diagnosed had the highest incidence irrespective of breed, age or type of management. In 898 male bovines with genital diseases, acroposthitis-phimosis was detected in 728 (81%), penile deviation in 46 (5.20%), glans fibropapilloma in 23 (2.60%), preputial abscesses in 14 (1.60%), penile fracture in 11 (1.20%) and other diseases in 76 (8.4%) animals (Table 1). In Figure 2 (A and B), percentages of penile and preputial lesions in certain bovine breeds are shown. These results were different from those of KAMILOGLU et al. (2004), who found penile fractures in 42 (28%), glans fibropapillomas in 29 (19.30%), acroposthitis-phimosis in 22 (14.60%) and phimosis in 22 (14.60%) of the bulls.

In 728 bulls with acroposthitis-phimosis, six breeds were most affected: Nelore, Gyr, Tabapuã, Santa Gertrudis, Brahma and Indubrazil with 380 (52.20%), 252 (34.60%), 22 (3.0%), 19 (2.60%), 15 (2.05%) and 11 (1.50%) of the diseased bulls, respectively. These results confirmed the predisposition of zebu and some *Bos taurus* breeds to this illness, considering their anatomical characteristics, as observed by GIBBONS (1956), SILVA et al. (1998) and RABELO et al. (2006).

Forty-six cases of penile deviation diagnosed. Six (13%) were observed in Holstein bulls, five (10.80%) in Gyr and Santa Gertrudis and four (8.7%) in Nelore or Brown Swiss bulls. Thirty one (67.5%) bulls were under 60 months of age. The owners reported that of these animals, mainly the Holsteins, showed adequate libido. The incidence of penile deviation was different from that of other genital diseases reported in this study, since older and zebu bulls were

most affected. Based on this finding, it could be inferred that early and inappropriate breeding and a height disproportion between young bulls and females could compromise penile penetration. These factors, when they cause injuries to tunica albuginea or dorsal apical ligament of the penis, could promote acquired penile deviation or penile fractures as described by ASHDOWN & SMITH (1969) and BENTO (2005).

TABLE 1. Absolute numbers and percentages reproductive tract diseases in 898 bulls of different breeds and ages on 417 farms in the state of Goiás, Brazil, between 1982 and 2007

Reproductive tract diseases	Affected bulls	
	Total	Percentage
Escrotal abscess	03	0.30
Preputial abscess	14	1.60
Acroposthitis-phimosis	728	81.0
Balanoposthitis	02	0.20
Penile deviation	46	5.20
Preputial dilaceration	02	0.20
Anterior preputial diverticulitis	05	0.60
Posterior preputial diverticulitis	03	0.30
Glans fibropapilloma	23	2.60
Preputial fibropapilloma	03	0.30
Phimosis	19	2.20
Fistula hemorrhagic	02	0.20
Penile fracture	11	1.20
Persistent frenulum	07	0.80
Inguino-escrotal hernia	01	0.10
Umbilical hernia	01	0.10
Orchitis	03	0.30
Paraphimose	11	1.20
Bifid penis	01	0.10
Rudimentary penis	04	0.50
Traumatic testicle	04	0.40
Testicle tumor	05	0.60
Total	898	100

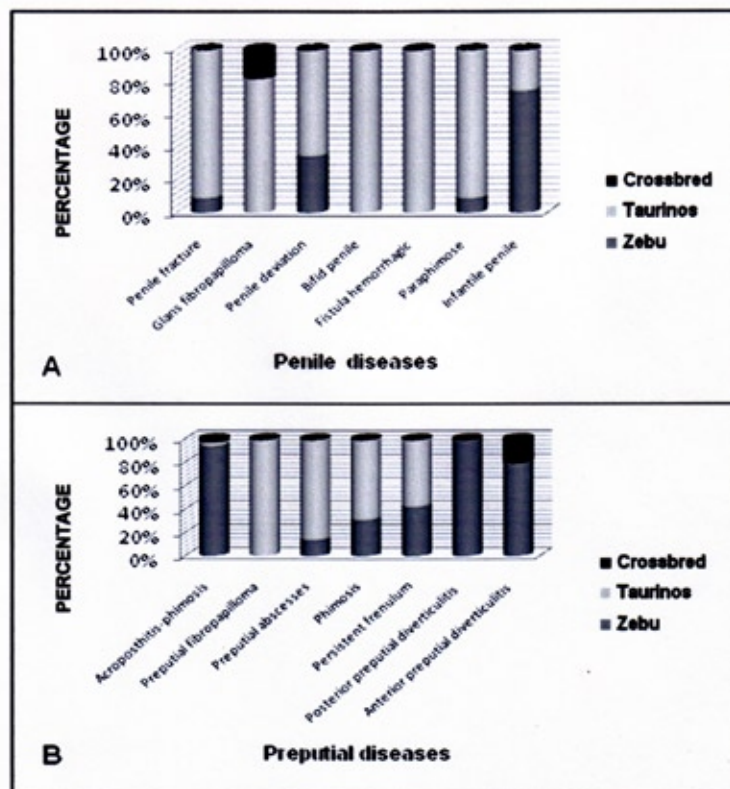


FIGURE 2. Percentage of penile (A) and preputial (B) diseases in the different breeds of bulls on 417 farms in the state of Goias, Brazil, between 1982 and 2007.

The service capacity test cited by MARTINS (2002) and SANTOS et al. (2004) was essential in order to confirm and classify penile deviation. However, SILVA et al. (1998) and GARNERO & PERUSIA (2006) found that local anesthesia of the pudendal and hemorrhoidal nerves was more efficient in diagnosing other disorders. MCGOWAN et al. (2002) evaluated 473 Santa Gertrudis bulls without local anesthesia and reported that the principal lesions were persistence of frenulum, 20 (4.23%), chronic epididimitis, 14 (2.95%) and balanoposthitis, 8 (1.79%). Using the service capacity test as employed in this study, on 179 Red Belmont bulls, these authors observed four (2.23%) animals with lateral or ventral penile deviation. In a study of 1,083 British beef bulls, BLOCKEY et al. (1984) reported that 60% of the herd was affected by spiral penile deviation in various degrees, confirming the importance of this test in diagno-

sing reproductive tract diseases.

In farms where penile or preputial fibropapilloma was detected, the farm owners observed that the disease was observed in other animals in cutaneous form. This fact suggested the possibility of a relationship between the two forms of disease. Of 26 cases of penile or preputial fibropapilloma, only two (7.7%) were not accompanied by cutaneous papillomatosis. FERREIRA et al. (1983) and SILVA et al. (2002) described this possibility. Sodomy, specially when detected in young bulls, could be the cause of traumatic glans lesions, favoring infection of the penile epithelium by the agent according to these authors.

In spite of the small number of cases of persistence of preputial frenulum in this study, this disease was detected in four (57.15%) of seven animals with low efficiency on the libido test. Young animals presented a less marked attraction to females in comparison to others bulls. For this

reason, it is reasonable to consider that sexually cold bulls masturbated infrequently, contributing to the persistence of preputial frenulum after puberty.

Of the 14 cases of preputial abscesses, nine (64.28%) were found in *Bos Taurus* and six (36%) in Holstein bulls. External parasites such as the flea larvae *Dermatobia hominis* and the *Boophilus microplus* tick or a lack of hygiene in the shearing of preputial hairs were the mainly causes. Inadequate acclimatization to warm and rainy weather, particularly in Center West of Brazil, undoubtedly facilitated infestation. The great degree of parasitism, inappropriate treatment and an excess of mud in corrals favored dirt accumulation in the prepuce and, consequently, the appearance of preputial abscesses as reported by FIGUEIREDO et al. (1999). To support this theory, six (42.86%) animals were observed to have mucosal ulcers near the preputial ostium and mycosis prior to the formation of preputial abscess.

The preputial lacerations observed during the study were related to injuries caused by barbed wire when animals jumped over ran through fences, behavior considered typical of irascible or poorly managed animals. SILVA et al. (1998) also considered barbed wire accidents, swine bites and poultry pecks in the etiopathogeny of preputial injuries

An important finding was that, of the farmers 256 out of 417 (61.50%) treated genital diseases empirically and rejected adequate clinical examination. This situation condemned a large number of animals to slaughter, including valuable bulls. A similar situation was described by KAMILOGLU et al. (2004), between 2000 and 2003, in 150 cases of penile and preputial disorders. Twenty five (16.70%) bulls were discarded without clinical evaluation or therapeutic and/or surgical treatment.

These results showed the importance of this research, particularly because it involves an understanding of the etiopathogeny, risk factors and preventive procedures for diseases which affect external male bovine genitalia, as well as their economic impact in the production system.

CONCLUSIONS

On the basis of this study, it can be concluded that: (1) epidemiological factors were related to a high occurrence of reproductive tract diseases in bulls with multifactorial origin; (2) Handling and breed characteristics of the bulls were decisive in the etiopathogeny of bull genital diseases.

REFERENCES

- ASHDOWN, R. R.; SMITH, J. A. The anatomy of the cavernosum penis of the bull and its relationship to spiral deviation of the penis. **Journal of Anatomy**, v. 104, n. 1, p. 153-159, 1969.
- BENTO, R. T. **Implante de tendão autólogo do músculo flexor superficial dos dedos no reparo de desvio do pênis de bovinos**. 2005. 25 f. Dissertação (Mestrado em Ciências Veterinárias) – Escola de Veterinária, Universidade Federal de Uberlândia, Uberlândia, 2005.
- BLOCKEY, M. A.; TAYLOR, E. G. Observations on spiral deviation of the penis in beef bulls. **Australian Veterinary Journal**, v. 61, n. 5, p. 141-145, 1984.
- CHAVES, S. M. **Avaliação de rufiões bovinos preparados pelos métodos do desvio lateral modificado e da aderência do pênis à parede abdominal**. 2002, 116 f. Dissertação (Mestrado) – Escola de Veterinária, Universidade Federal de Goiás, Goiânia, 2002.
- CURI, P. R. **Metodologia e análise de pesquisa em ciências biológicas**. Botucatu: Téponic Gráfica e Editora, 1997.
- DESROCHERS, A.; ST-JEAN, G.; ANDERSON, D. E. Surgical management of preputial injuries in bulls: 51 casos (1986-1994). **Canadian Veterinary Journal**, v. 36, n. 9, p. 553-556, 1995.
- EURIDES, D.; BOMBONATO, P. P.; SILVA, L. A. F.; FIORAVANTI, M. C. S.; VERSESI FILHO, A. E.; MEDEIROS, A. A. Correção cirúrgica da ruptura de pênis em bovinos. **Veterinária Notícias**, v. 2, n. 1, p. 37-43, 1996.
- FERREIRA, H. I.; SILVA, L. A. F.; SILVEIRA, J. M.; DEL CARLO, R. J.; ALVES, G. E. S.; TONIOLLO, G. H. Fibropapilomatose peniana bovina: relato de dois casos. **Revista Brasileira de Reprodução Animal**, v. 7, n. 2, p. 47-50, 1983.

- FIGUEIREDO, L. T. M.; BADRA, S. J.; PEREIRA, L. E. Relato sobre carrapatos coletados no Sudeste e Centro-Oeste do Brasil, analisando a potencial transmissão de microorganismos de carrapatos para o homem. **Revista da Sociedade Brasileira de Medicina Tropical**, v. 32, n. 6, p. 613-619, 1999.
- FRENEAU, G. E.; GUIMARÃES, J. D. **I Curso teórico prático de andrologia bovina**. Goiânia. Laboratório de Andrologia e Tecnologia de Sêmen da EV/UFG. 2000. 55 p. [Apostila].
- GARNERO, O. J.; PERUSIA, O. R. **Manual de anestesia e cirurgia de bovinos**. São Paulo: Tecmedd, 2006.
- GIBBONS, W. I. Genital diseases of bulls. I. Diseases of the penis and sheath. **The North American Veterinary**, p. 650-655, 1956.
- GILBERT, R. O. The diagnosis of short penis as a cause of impotentia coeundi in bulls. **Theriogenology**, v. 32, n. 5, p. 805-815, 1989.
- HAFEZ, E. S. E. **Reprodução animal**. 7. ed. São Paulo: Editora Manole, 2004.
- HOOPER, N. Surgical management of preputial injuries in bulls. In: CONGRESSO MUNDIAL DE BUIATRIA, 23., 2004. Quebec, Canadá. **Anais...** Quebec, Canadá, 2004. Disponível em: <<http://www.ivis.org/proceedings/wbc/wbc2994/WBC2004-Hooper-simple.pdf>> Acesso em: 12 jan. 2007.
- ISA, J. F.; MAGEMBE, S. R.; NAUDE, T. W. Devil's claw (*Harpagophytum procumbens*) in a Brahman's preputial sheath: a case report from Botswana. **Journal of the South African Veterinary Association**, v. 72, n. 1, p. 55-56, 2001.
- KAMILOGLU, A.; OZTURK, S.; KLC, E.; AKSOY, O. **Management of penile and preputial disorders in bulls: 150 cases (2000-2003)**, v. 10, n. 1, p. 31-36, 2004. Disponível em: <http://www.cabaabstractsplus.org/google/abstract> Acesso em: 12 jan. 2007.
- MARQUES, J. A.; MARQUES, L. C.; CANOLA, J. C.; CATTELAN, J. W. A acropostite-fimose em touros: uma técnica cirúrgica de tratamento. **Ciência Veterinária**, v. 2, n. 1, p. 2-3, 1988.
- McDIARMID, J. J. "Corkscrew penis" and other breeding abnormalities in beef bulls. **New Zealand Veterinary Journal**, v. 29, n. 3, p. 35-36, 1981.
- McGOWAN, M. R.; BERTRAM, J. D.; FORDYCE, G.; FITZPATRICK, L. A.; MILLER, R. G.; JAYAWARDHANA, G. A.; DOOGAN, V. J.; FAVERI, J. DE.; HOLROYD, R. G. Bull selection and use in northern Australia I. Physical traits. **Animal Reproduction Science**, v. 71, p. 25-37, 2002.
- MEMOM, M. A.; DAWSON, L. J.; USENIK, E. A.; RICE, L. E. Preputial injuries in beef bulls: 172 cases (1980-1985). **Journal American Veterinary Medicine Association**, v. 193, n. 4, p. 481-485, 1988.
- PARKER, W. G.; BRAUN, R. K.; BEAN, B.; HILLMAN, R. B.; LARSON, L. L.; WILCOX, C. J. Avulsion of the bovine prepuce from its attachment to the penile integument during semen collection with an artificial vagina. **Theriogenology**, v. 28, n. 2, p. 237-256, 1987.
- RABELO, R. E.; SILVA, L. A. F.; VIU, M. A. O.; ROMANI, A. F.; ALVES, C. B.; FERNANDES, J. J. R.; CASTRO, C. F. P. Acrobustite bovina: revisão de literatura. **Revista CFMV – Suplemento Técnico**, Brasília, Ano XII- n. 37, p. 29-36, 2006.
- RIET-CORREA, F.; FREITAS, A.; PUIGNAU, M. V. Ulcerative posthitis in bulls in Uruguay. **Cornell Veterinary**, v. 69, n. 1, p. 33-44, 1979.
- SANTOS, M. D.; TORRES, C. A. A.; RUAS, J. R. M.; SILVA FILHO, J. M.; COSTA, E. P.; PEREIRA, J. C. Teste da libido e atividade de monta em touros da raça Nelore. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 56, p. 504-510, 2004.
- SAUNDERS, P. J.; LADDS, P. W. Congenital and developmental anomalies of the genitalia of slaughtered bulls. **Australian Veterinary Journal**, v. 54, p. 10-13, 1978.
- SILVA, L. A. F.; EURIDES, D.; BENTO, L. R. T.; SILVA, O. C.; RABELO, R. E.; SILVA, M. A. M.; PASCOAL, L. M.; FERRAZ, H. T.; MOURA, M. I.; LOPES, D. T.; SILVA, E. B. **Implante de retalho peniano homólogo na correção cirúrgica de desvio traumático de pênis em bovinos**. In: CONBRAVET – CONGRESSO BRASILEIRO DE MEDICINA VETERINÁRIA, 31., 2004, São Luiz do Maranhão. **Anais...** São Luis do Maranhão, 2004. CD-ROM.
- SILVA, L. A. F.; FIORAVANTI, M. C. S.; BORGES, N. C.; CARNEIRO, M. I.; SILVA, C. A. Utilização do avental como auxiliar no pós-operatório da acrobustite ou acropostite-fimose. **Anais da Escola de Agronomia e Veterinária**, v. 24, p.142-147, 1994.
- SILVA, L. A. F.; FORAVANTI, M. C. S.; ACYPRESTE, C. S.; EURIDES, D.; SILVA, C. A.; FÁRIA, A. C. Tratamento cirúrgico da estenose e/ou fibrose prepucial em touros. **ARS Veterinária**, v. 14, n. 2, p. 235-344, 1998.

- SILVA, L. A. F.; VERÍSSIMO, A. C. C., FERREIRA, M. R.; MATOS, E. S.; FILHO, P. R. L. V.; FIORAVANTI, M. C. S.; SILVA, C. A.; CASTRO, G. R. Papilomatose cutânea bovina: revisão de literatura. **A Hora Veterinária**, v. 22, n. 127, p. 27-31, 2002.
- SIQUEIRA, V. J.; BERNIS, W. O.; BERNIS FILHO, W. Acropostite bovina: nova técnica cirúrgica e seu tratamento. In: CONGRESSO BRASILEIRO DE CIRURGIA E ANESTESIOLOGIA VETERINÁRIA, 4., Goiânia, 2000. **Anais...** Goiânia, CBCAV, 2000. p. 132.
- THRUSFIELD, M.; MANSLEY, L.; DUNLOP, P.; TAYLOR, J.; PAWSON, A.; STRINGER, L. The foot-and-mouth disease epidemic in Dumfries and Galloway: characteristics and control. **The Veterinary Record**, v.156, n.8, 2005. p. 229-252.
- TROCÓNIZ, J. F.; BELTRAN, J.; BASTIDAS, H.; LARREAL, H.; BASTIDAS, P. Testicular development, body weight changes, puberty and sêmen traits of growing guzerat and nellore bulls. **Theriogenology**, v. 35, n. 4, p. 815-826, 1991.
- TURNER, A. S.; McILWRITH, C. W. **Técnicas cirúrgicas em animais de grande porte**. São Paulo: Roca, 1985. p. 103-108.
- VAN SAUN, R. J.; CISZEWSKI, D. K. Preputial foreign body in a bull. **Journal of the American Veterinary Medical Association**, v. 194, n. 9, p. 1303-1304, 1989.
- VIU, M. A. O.; TONHATI, H.; CERÓN-MUNÓZ, M. F. Parâmetros genéticos do peso e escores visuais de prepúcio e umbigo em gado de corte. **ARS Veterinária**, v. 18, n. 2, p. 179-184, 2002.
- WALKER, D. F. Causes of copulatory failure in beef bulls. **Modern Veterinary Practice**, p. 252-256, 1984.
- WALKER, D. F.; VAUGHAN, L. T. **Bovine and equine urogenital surgery**. Philadelphia: Lea & Febiger, 1980. 277 p.

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