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Tese

Dermatite por farelo de arroz desengordurado e outras doenças de pele diagnosticadas em bovinos na Região Sul do Rio Grande do Sul

Fabiano da Rosa Venancio

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Banca examinadora:

Dra. Ana Lucia Schild
Doutora em Ciências/Patologia pela Universidade Federal de Santa Maria

Prof. Dr. Claudio Severo Lombardo de Barros
Doutor em Patologia Veterinária pela Colorado State University

Prof. Dra. Eliza Simone Viégas Sallis
Doutora em Ciências Veterinárias pela Universidade Federal de Santa Maria

Prof. Dra. Margarida Buss Raffi
Doutora em Ciências Veterinárias pela Universidade Federal de Santa Maria

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Resumo

VENANCIO, Fabiano da Rosa. **Dermatite por farelo de arroz desengordurado e outras doenças de pele diagnosticadas em bovinos na Região Sul do Rio Grande do Sul.** 2025. 58f. Tese (Doutorado) - Programa de Pós-Graduação em Veterinária, Faculdade de Veterinária, Universidade Federal de Pelotas, Pelotas, 2025.

O farelo de arroz desengordurado (FAD), subproduto do beneficiamento do arroz, tem sido utilizado na alimentação de bovinos leiteiros e de corte, no entanto, casos de intoxicação por este alimento, com lesões de pele observadas nos membros e atribuídas a hipersensibilidade tipo I têm ocorrido no Brasil e no Uruguai. Os objetivos desta tese foram reproduzir experimentalmente a intoxicação por FAD em bovinos; comprovar seu caráter alérgico, sua patologia e sua patogenia com vistas a indicar seu uso na alimentação animal de forma eficiente e segura. Objetivou-se, também, fazer um estudo retrospectivo dos casos espontâneos de intoxicação por FAD diagnosticados no Laboratório Regional de Diagnóstico da Faculdade de Veterinária da UFPel (LRD/UFPel). Somando-se a isso foi realizado, também, um estudo retrospectivo das principais enfermidades de pele que afetam bovinos na área de influência do LRD/UFPel estabelecendo qual a sua importância na região Sul do Estado. Para a reprodução experimental da intoxicação por FAD o mesmo foi administrado para 12 bovinos divididos em três grupos, em quantidades de 0,5%, 1,0% e 2,0% do peso corporal de cada bovino, até que apresentassem lesões. Foi realizada coleta de sangue dos bovinos para hemograma e dosagem de IgE. As lesões macroscópicas observadas nos bovinos que receberam inicialmente 1,0%, e 2,0% de FAD caracterizaram-se por hiperemia com alopecia e edema na região do boleto que evoluiram para lesão ulcerada, com espessamento e ressecamento da pele, rachaduras e crostas. As lesões histológicas observadas em biopsias caracterizaram-se por dermatite hiperplásica subaguda difusa acentuada. A dosagem de IgE apresentou resultados inconclusivos e os hemogramas estavam dentro dos parâmetros normais. No estudo retrospectivo foram identificados quatro surtos da enfermidade com lesões caracterizadas por dermatite proliferativa similar às lesões dos casos experimentais. Conclui-se que o FAD nas condições deste experimento, poderia ser administrado de forma controlada aos bovinos em doses até 0,5% do peso corporal dos animais. A administração do FAD em períodos alternados com intervalos de pelos menos 15 dias, seria também uma forma de utilizar este alimento sem o risco de ocorrência da doença. No estudo das enfermidades de pele em bovinos concluiu-se que as de natureza infecciosas e/ou inflamatórias, como dermatofilose, papilomatose e dermatofitose representaram mais da metade dos casos de dermatopatias diagnosticadas em bovinos e são causa de prejuízos econômicos para a pecuária da região

Palavras-chave: Bovinos; dermatite; dermatofilose; doenças de pele; farelo de arroz desengordurado; fotossensibilização hepatógena; hipersensibilidade tipo I.

Abstract

VENANCIO, Fabiano Venancio. **Dermatitis due to defatted rice bran and other skin diseases diagnosed in cattle in the Southern Region of Rio Grande do Sul.** 2025. 58f. Thesis (Doctor degree in Sciences) - Programa de Pós-Graduação em Veterinária, Faculdade de Veterinária, Universidade Federal de Pelotas, Pelotas, 2025.

Defatted rice bran (DRB), a byproduct of rice processing, has been used in the feeding of dairy and beef cattle. However, cases of poisoning by this food, with skin lesions observed on the limbs and attributed to type I hypersensitivity, have occurred in Brazil and Uruguay. The objectives of this thesis were to experimentally reproduce DRB poisoning in cattle; to prove its allergic character, its pathology and its pathogenesis with a view to indicating its use in animal feed in an efficient and safe manner. The aim was also to conduct a retrospective study of spontaneous cases of DRB poisoning diagnosed in Laboratório Regional de Diagnóstico da Faculdade de Veterinária da UFPel (LRD/UFPel). In addition to this, a retrospective study was also carried out on the main skin diseases that affect cattle in the area of influence of the LRD/UFPel, establishing their importance in the southern region of Brazil. For the experimental reproduction of DRB poisoning, it was administered to 12 cattle divided into three groups, in quantities of 0.5%, 1.0% and 2.0% of the body weight of each cattle, until they presented lesions. Blood was collected from the cattle for hemogram and IgE dosage. The macroscopic lesions observed in cattle that received 1.0% and 2.0% DRB were characterized by hyperemia with alopecia and edema in the fetlock region that evolved into an ulcerated lesion, with thickening and dryness of the skin, cracks and crusts. The histological lesions observed in biopsies were characterized by marked diffuse subacute hyperplastic dermatitis. The IgE dosage showed inconclusive results and the blood counts were within normal parameters. In the retrospective study, four outbreaks of the disease were identified with lesions characterized by proliferative dermatitis similar to the lesions of the experimental cases. It is concluded that DRB, under the conditions of this experiment, could be administered in a controlled manner to cattle in doses up to 0.5% of the animals' body weight. The administration of DRB in alternating periods with intervals of at least 15 days would also be a way of using this food without the risk of the disease occurring. In the study of skin diseases in cattle, it was concluded that those of an infectious and/or inflammatory nature, such as dermatophilosis, papillomatosis and dermatophytosis, represented more than half of the cases of dermatopathies diagnosed in cattle and are the cause of economic losses for livestock in the region.

Keywords: Cattle; dermatitis; dermatophilosis; skin diseases; defatted rice bran; hepatogenous photosensitization; type I hypersensitivity.

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1 Introdução

Em ruminantes, as doenças de pele são responsáveis por intenso desconforto e manifestam-se como lesões pruriginosas, alopécicas, nodulares ou crostosas, ocorrendo por envolvimento primário da pele ou secundário à lesão em outros sistemas (SCOTT 2018). A maioria dessas enfermidades ocorre em diferentes espécies de ruminantes podendo apresentar variações na gravidade das lesões e na evolução dos sinais clínicos, causando prejuízos econômicos variáveis (MACEDO et al. 2008, FACCINI et al. 2022). Estas dermatopatias em animais de produção, especialmente bovinos, podem ter diversas etiologias e muitas estão relacionadas com problemas nutricionais, agentes infecciosos, processos alérgicos ou tóxicos entre outros (DUTRA 1998; MOTTA et al. 2000; HENSEL 2010, PEREIRA & MEIRELLES 2023; SCHILD 2023). A relação dessas enfermidades com a alimentação tem relevância já que, devido ao crescimento no consumo e exportação da carne e leite bovino, os produtores rurais vêm buscando ampliar sua produção para suprir o mercado garantindo a demanda e mantendo a qualidade utilizando diferentes subprodutos de cereais na alimentação dos bovinos (IBGE, 2017; BAILONE, 2019; ESTIMA-SILVA et al. 2020). Por esta razão a criação de bovinos para engorda em confinamento tem aumentado significativamente nos últimos anos devido a possibilidade de muitos animais serem preparados para o abate em um espaço reduzido. Neste contexto é necessária a oferta de grande quantidade de alimento de boa qualidade para estes animais (BAILONE, 2019).

A industrialização do arroz produz uma série de subprodutos, entre eles o arroz integral, do qual, após a extração do óleo, obtém-se farelo de arroz desengordurado (FAD) (LEITE, 2006), que apresenta como principal vantagem a não rancificação permitindo que o produto seja armazenado por um período prolongado (WHITE & HEMBRY, 1985; PRASAD et al., 1990). Esse subproduto principalmente em regiões produtoras de arroz como a Região Sul do Rio Grande do Sul representa uma importante fonte de alimento rico em proteínas, que pode ser utilizado na alimentação de bovinos criados em confinamento ou a campo e que necessitam de suplementação, principalmente nas épocas de carência de forragem.

Por outro lado, têm sido descritos casos de intoxicação por este alimento tanto em bovinos leiteiros como bovinos de corte no Brasil (BRUM et al., 2012; SANTOS et al., 2021) e no Uruguai (DUTRA, 1998; DUTRA & CESAR, 2000). Um estudo da epidemiologia da doença e sua patologia foi realizado no Uruguai sendo estabelecido alguns parâmetros sobre esta intoxicação naquele país (DUTRA, 1994; DUTRA, 1998).

A enfermidade caracteriza-se por uma dermatite com lesões de pele localizadas, preferentemente, na porção distal dos membros posteriores, podendo afetar os membros anteriores, porém com menor frequência, sendo atribuída a uma hipersensibilidade tipo I (DUTRA, 1994; DUTRA, 1998; BRUM et al., 2012). A reação de hipersensibilidade do tipo I ou imediata é mediada por IgE, mastócitos, basófilos e eosinófilos. Após a sensibilização prévia, o segundo contato com o alérgeno resulta na degranulação de mastócitos com a liberação de histamina e mediadores inflamatórios associados com as lesões teciduais e sinais clínicos nos animais afetados (DISPENZA, 2019).

As lesões iniciais da intoxicação caracterizam-se por eritema e edema da banda coronária, metatarso e boleto, posteriormente evoluem para ulceração com formação de crostas de 0,5-1cm de espessura formadas por pelos emaranhados e exsudação. Os animais podem apresentar calor e inchaço no local, prurido e em alguns casos claudicação (DUTRA, 1998; SCHILD, 2023). Em casos graves as lesões podem se estender até a região do tarso, entrepernas, escroto e o úbere. Porém, esta forma ocorre apenas em animais adultos como vacas leiteiras e novilhos de engorda (DUTRA & CESAR, 2000). Como diagnósticos diferenciais desta enfermidade deve ser considerado, aquelas que causam o mesmo tipo de lesão nos membros, que cursem com sinais clínicos e lesões macroscópicas e histológicas semelhantes, como: deficiência de Zinco, Intoxicação por Cádmio e Selênio e intoxicação por *Festuca arundinacea*, gramínea de clima temperado que é infectada por fungos endofíticos do gênero *Neotyphodium*, que causam o ergotismo gangrenoso nos animais (DUTRA, 1998) e, ainda, dermatofilose.

Os objetivos desta tese foram reproduzir experimentalmente a intoxicação por farelo de arroz desengordurado (FAD) para comprovar seu caráter alérgico. Objetivou-se, também, fazer um estudo retrospectivo dos casos diagnosticados no Laboratório Regional de Diagnóstico da Faculdade de Veterinária da UFPel (LRD/UFPel), estabelecendo-se em que condições epidemiológicas a enfermidade

ocorre, bem como descrever sua patologia e patogenia, para propor a utilização deste subproduto do arroz em doses seguras uma vez que, por apresentar alto teor de proteína e ter baixo custo, pode ser uma alternativa para a alimentação de bovinos, especialmente em épocas de carência de forragem ou animais que estão em confinamento para engorda. Por último objetivou-se, também, determinar, por meio de um estudo retrospectivo, quais as principais enfermidades de pele que afetam bovinos na área de influência do LRD/UFPel.

2 Artigos

2.1 Artigo 1

Intoxicação por farelo de arroz desengordurado em bovinos: reprodução experimental e perspectivas

Fabiano da Rosa Venancio, Franklin Riet-Correa, Eliza Simone Viégas Sallis e Ana Lucia Schild

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Defatted rice bran poisoning in cattle

Fabiano da Rosa Venancio[a], Franklin Riet-Correa[b], Eliza Simone Viégas Sallis[c] e Ana Lucia Schild[c*]

[a] *Pos-graduate Program, Veterinary School (FV), Federal University of Pelotas (UFPel), Campus Capão do Leão, Capão do Leão, RS, 96010- 900, Brazil*

[b] *Pos-graduate Program on Animal Sciences, Federal University of Bahia , Salvador, BA, Brazil*

[c] *Regional Diagnostic Laboratory, FV, UFPel, Campus Capão do Leão, Capão do Leão, RS, 96010-900*

ABSTRACT

Defatted rice bran (DRB) causes a dermatitis in bovines affecting mainly the distal portion of the hind limbs. Outbreaks of poisoning by this food in both dairy and beef cattle in Brazil and Uruguay have been reported with morbidity varying from 10% to 100%. The objectives of this study were to reproduce DRB poisoning by determining the maximum dose that can be administered without causing injury; to carry out a retrospective study of the outbreaks diagnosed by the Regional Diagnostic Laboratory of the Veterinary School, Federal University of Pelotas; and to study the epidemiology and pathogenesis of the disease. For the experimental reproduction of the poisoning, 14 cattle aged 22 to 32 months were used. They were supplemented with DRB at doses of 0.5%, 1% and 2% of body weight (BW) with and without prior adaptation, daily, until lesions appear. Two cattle were used as controls. A complete blood count and determination of total plasma protein and IgE were performed on all experimental and control animals. The results demonstrated that DRB causes skin lesions in cattle at doses of 1.8% to 2% of the animals' BW and that it could be administered in a controlled manner to cattle at doses up to 0.5% of the animals' body weight. The disease affects animals of any age and the pathogenesis of envenomation is likely to be associated with type IV hypersensitivity due to the presence of T lymphocytes in the lesions that characterize cell-mediated hypersensitivity.

Key words: cattle, defatted rice bran, dermatitis, type IV hypersensitivity,

1. INTRODUCTION

The industrialization of rice produces a series of by-products, including brown rice, from which, after extracting the oil, using the hexane solvent extraction method, defatted rice bran (DRB) is obtained. The main advantage of DRB is that it does not go rancid, allowing the product to be stored for a long period [1, 2, 3]. The average composition of samples of DRF from Brazil and Uruguay was: crude protein 17.7%, neutral detergent fiber 52.4%, acid detergent fiber 14.6%, hemicellulose 39.8%, fat 1.3%, ash 11.3%, Ca 0.04%, P 2.24%, Zn 92 ppm, and Cu 10ppp, all on a dry matter basis [4]. However, cases of poisoning by this food have been described in both dairy and beef cattle in Brazil. [5, 6, 7] and in Uruguay [4, 8, 9].

The first report of this poisoning occurred in Uruguay when a clinical-pathological condition characterized by dermatitis with lesions located, preferably, in the distal portion of the hind limbs was described [4]. This report recorded spontaneous outbreaks of the disease on eight different farms in Uruguay, all feeding cattle with DRB, which led to the suspicion that this food was the cause of the disease. Epidemiological studies carried out on these farms showed that the disease appeared between 10 and 60 days after the start of DRB administration [4]. Cows, heifers, calves, bulls and steers were affected, with morbidity ranging from 10% to 100%. [4]. A new study was subsequently conducted in 12 farms to confirm the cause and pathogenesis of the disease [8]. In this study, the author observed that the disease can appear up to 90-120 days after the start of DRB administration, with an average morbidity of 13% in cattle up to one-year-old and 39% in older cattle [9]. Age and supply without prior adaptation to DRB were important risk factors for the occurrence of the disease. In these outbreaks, the animals ingested DRB at doses of 0.4% to more than 1% of their BW per day during periods of 10 to 60 days [8].

Initial lesions of DRB poisoning are characterized by erythema and edema of the coronary band, metatarsus and fetlock. These lesions evolve into ulceration with the formation of 0.5-1 cm thick crusts formed by matted hair and exudation. Some animals present heat, swelling and itching in the affected area and, in some cases, lameness [9, 10]. In severe cases, the lesions can extend to the tarsus, crotch, scrotum and udder. However, this severe form only occurs in adult animals such as dairy cows and fattening steers [9]. Histologically, these lesions characterize a picture of perivascular dermatitis composed of lymphocytes, histiocytes and eosinophils, in addition to epidermal hyperplasia with ortho

or parakeratotic hyperkeratosis [6, 8, 10].

In studies carried out in Uruguay, it was concluded that the disease would be due to type I hypersensitivity, mediated by IgE and also by type IV hypersensitivity, mediated by cells [8]**.** This author performed intradermal tests using DRB extract, with 12.2% soluble proteins, that was incubated for 24 hours at 40º with NACl (0.15N). After centrifugation the supernatant was injected at a dose of 0.02 ml into the caudal fold of control cattle and cattle that had been ingesting DRB for 4 months. Increased caudal fold thickness was observed 1-2 h after inoculation of cattle ingesting DRB. These cattle developed mild disease 10 days after challenge. A passive cutaneous test was also performed to detect the presence of IgE in the serum. The test consisted of injecting 0.2 ml of intradermal serum from animals that ingested DRB into cattle that had never ingested the bran and, 72 h later, injecting 0.2 ml of the bran extract and 20 ml of Evans blue intravenously. In this experiment, five tested cattle developed an immune response characteristic of Type I allergies (IgE-mediated), since the cattle showed a bluish color reaction at the inoculation site. Control cattle were negative [8]. The presence of other immunoglobulins (IgG and IgM) was also tested by immunodiffusion in Agar gel, which was negative in all cattle. This negative results suggested that the hypersensitivity could also be type IV, which coincides with the histopathology findings and with what has been mentioned in the literature on food allergies. [8, 11].

The objectives of this work were to experimentally reproduce defatted rice bran poisoning to prove its allergic nature and to carry out a retrospective study of the outbreaks in the Regional Diagnostic Laboratory of the Veterinary School, Federal University of Pelotas (LRD/UFPel). We describe the epidemiological conditions in which the disease occurs, as well as its pathology and pathogenesis. Finally, we propose the use of this rice by-product in safe doses in cattle feed.

2. Material and methods

1. Study of spontaneous outbreaks of DRB dermatitis diagnosed at LRD/UFPel in cattle. A retrospective study of dermatitis outbreaks caused by the consumption of DRB diagnosed in the area of influence of LRD/UFPel was carried out. In the LRD records we obtained information on morbidity and mortality rates, other epidemiological characteristics of the disease, as well as its clinical signs and pathology.

2. Experimental reproduction of DRB dermatitis in cattle. The experiment was carried out in a dairy cooperative in the municipality of Piratini, 75 km from LRD/UFPel (31º30'40" S e 53º03'49" W).

Fourteen cattle aged between 22 and 32 months were used, of which 12 were supplemented with DRB and two remained as controls. The cattle were divided into four groups. Group 1 (5 cattle- #1, 2, 3, 4 and 5) received 1% of body weight (BW) of DRB for six days and then received 2% of BW of DRB until the end of administration. Group 2 (5 cattle- #6, 7, 8, 9 and 10), received DRB in increasing doses of 1% of BW for two days, 1.2% of BW for four days, 1.4% of BW for five days, 1.6% of BW for five days, and 1.8% of BW for another five days; this treatment was to determine whether the animals would adapt to the food, preventing the occurrence of lesions. Group 3 (2 cattle- #11 and 12) received 0.5% of BW of DRB throughout the experimental period. Group 4 (2 cattle- #13 and 14) did not receive DRB and remained as control.

Cattle were weighed before the start of the experiment (Day 0), on the 17th day of the experiment (Day 17), and at the end of the experiment (Day 22). To identify whether there was difference between the average weight of the cattle in the three evaluations (Day 0, Day 17th and Day 22), the factorial ANOVA test and the Scott-Knott test were used to compare de average weight [12]. A general clinical examination was performed considering rectal temperature, heart rate, respiratory rate, and ruminal movements. The cattle were weighed on days 0, 17 and 22 after the start of the experiment and the amount of DRB consumption was adjusted for each cattle. When the first lesions were observed in four cattle, two from Group 1 and two from Group 2, DRB continued to be administered for two more days to assess the evolution of the lesions. During this two days, another cattle from Group 2 and two from Group 1 also presented lesions. On the third day after the appearance of lesions in the first four affected cattle, DRB was removed from the diet of all cattle.

Biopsies were performed on each affected bovine with lesions at different stages and at the end of the experiment on all experimental bovines. Biopsies were performed with a scalpel after trichotomy and anesthesia using 10% xylocaine at the collection site. Before the procedure, the animals were sedated with Xilasin 2% IV. After collecting the biopsies, the site was cleaned daily with a 10% iodine alcohol solution and then a healing agent was applied (Organnact Silver Insecticide and Healing Spray 500ml) until the lesion was completely healed. The biopsies were fixed in 10% buffered formalin and routinely

processed for histological study. The slides were stained with hematoxylin and eosin (HE) and toluidine blue and observed under an optical microscope. The immunohistochemistry (IHC) technique was performed to identify T and B lymphocytes present in the lesions of a bovine from Group 1. Sections were selected from the paraffin blocks and cut into 3 μm thick sections on silanized slides. The slides were deparaffinized and antigen retrieval was performed with the DAKO PT LINK system in the DAKO Envision Flex solution. The incubation of primary antibodies was performed in a DAKO/Agilent Autostainer Link 48 apparatus. The antibodies used were CD3 polyclonal rabbit and PAX5 clone DAK-Pax5, both from DAKO. The detection system used was the Envision DAKO, and DAB was used as the revealing substrate. A palatine tonsil section was used as a positive control. After DAB development, the slides were dehydrated, clarified and stained with Harris hematoxylin.

Blood samples from all animals were collected in vacutainer tubes (PROLAB) with EDTA anticoagulant and without anticoagulant, from the coccygeal vein, after asepsis of the site, once a week until the end of the experiment. The blood samples were stored under refrigeration for complete blood count analysis, at most one day after blood collection. The serum samples were frozen for later quantification of circulating Immunoglobulin E (IgE).

The intradermal test was performed on all cattle using a solution of DRB as inoculum according to the methodology described by Brum *et al* [6]. Measurements of the thickness of the caudal fold were performed before inoculation (T0), one hour after (T1), two hours after (T2), 24 hours after (T3) and 72 hours after (T4).

3. Results

3.1. Study of spontaneous outbreaks of DRB dermatitis diagnosed at LRD/UFPel in cattle. In the retrospective study on the disease, four outbreaks were identified. The first outbreak (outbreak 1) occurred in three groups of cattle on a farm, one with 150 feedlot 2.5-year-old cattle (group 1a); another with 180 1-2-year-old cattle, also feedlot (group 1b); and a third group of 180 1-2-year-old cattle that were grazing in a native pasture (group 1c). The lesions appeared between 20 and 35 days after the start of feeding DRB in confined animals (groups 1a and 1b) and after 35 days in cattle grazing in a native pasture (group 1c). The cattle in the three groups received a concentrated ration containing 90% rice bran.

In the other three outbreaks (outbreaks 2, 3 and 4) the cattle were in native grassland and began to receive DRB mixed with feed in different proportions, in collective troughs. Table 1 presents the epidemiological data for the four outbreaks. Lesions began to appear eight days (outbreak 2), 30-40 days (outbreak 3) and 20 days (outbreak 4) after the start of DRB consumption.

The lesions in all outbreaks were characterized by erythema and edema, followed by proliferative dermatitis with the formation of crusts and cracks in the skin of the pastern, coronary band, metatarsus and fetlock (Fig. 1A). Histologically, dermatitis with marked hyperkeratosis, ulceration of the epidermis and inflammatory infiltrate of eosinophils, neutrophils and lymphocytes distributed diffusely throughout the tissue and around the vessels were observed in the superficial dermis (Fig. 1B). In addition, epidermal hyperplasia with ortho or parakeratotic hyperkeratosis was also observed.

3.2 Experimental reproduction of DRB dermatitis in cattle. Clinical parameters remained within normal standards in all cattle throughout the experimental period. Of the 12 animals that ingested DRB, six cattle presented macroscopic lesions: three from Group 1 (#1, 4 and 5) and three from Group 2 (#6, 9, 10). Nine presented histological lesions [four from Group 1 (#1, 3, 4 and 5) and five from Group 2 (#6, 7, 8, 9 and 10). Macroscopic lesions occurred in the plantar region of the fetlock joint. In a bovine from Group 2 (#10) the lesions extended to the hind limbs and affected the ventral portion of the abdomen. A bovine from Group 1 (#4) also presented discrete lesions in the fetlock region of the forelimbs. The initial lesions occurred 19 days after the start of the experiment in four cattle, two from Group 1 (#1 and 5) and two from Group 2 (#6 and 10), being restricted to the pastern region of the hind limbs. In two cattle, one from Group 1 (#4) and one from Group 2 (#9), lesions were observed on the 21st day and DRB was removed from the diet on the 22nd day after the start of administration. The cattle in Group 3 did not present lesions. The lesions regressed one week after the end of DRB administration in all cattle except one in Group 2 that presented myiasis and secondary infection. It was treated with antibiotics and anti-inflammatory drugs and recovered after 30 days.

The macroscopic lesions observed in three cattle from Group 1 (#1, 4 and 5) and three from Group 2 (#6, 9 and 10) were characterized by the appearance of a hyperemic area, with alopecia and edema in the affected regions that evolved into an ulcerated lesion,

with thickening and dryness of the skin, cracks, and crusts formed by keratin remains and agglutinated hairs due to the exudate that flowed from the lesion (Fig. 1C and 1D).

The histological lesions observed in the affected cattle were characterized by marked diffuse subacute hyperplastic dermatitis. In three cattle, one from Group 1 (#3) and two from Group 2 (#7 and 8) that did not have macroscopic lesions, histological lesions characterized by mild infiltration of mononuclear inflammatory cells and scarce eosinophils around the blood vessels were observed (Fig. 2A). In one bovine from Group 1 (#3), infiltration was more pronounced and there was formation of small pustules inside the keratin layer.

In cattle that presented macroscopic lesions, histologically, there was marked mixed inflammatory infiltrate of lymphocytes, neutrophils and few eosinophils in the dermis and epidermis (Fig. 2B). In these cases, there was also acanthosis and hyperkeratosis. The inflammatory cells on the surface of the epidermis associated with the keratin layer formed the crusts observed macroscopically. The toluidine blue histochemical technique did not reveal the presence of mast cells in any of the biopsies.

The IHC technique was positive for the CD3 polyclonal antibody, evidencing the presence of T lymphocytes in the lesion (Fig. 2C and 2D).

The blood count results were within normal parameters in all cattle throughout the experimental period. The Elisa test to determine IgE in serum showed inconclusive results (Table 2) and the allergy test performed after the animals were cured also showed inconclusive results.

The cattle in this experiment not showed significative difference of weight between the first day of the experiment and the day of suspension of the DRB administration. All variances of weight of cattle did not differ statistically among days (0, 17 and 22 days) ($F_{2,30} = 0.597$, $p = 0.556$) (Table 3).

4. Discussion

The results obtained in this study demonstrated that DRB caused skin lesions in cattle at doses of 1.8% to 2% of the animals' BW. Animals that received doses of 0.5% of BW did not become ill. On the other hand, in a spontaneous outbreak diagnosed at LRD/UFPel, cattle became ill with an approximate dose of 0.08% of the BW of DRB in the diet, much lower than the dose used in the experiments reported here. However, these animals were fed collectively. In cattle fed in this way, it is difficult to estimate the amount

of DRB ingested individually, since dominant cattle in a group may ingest a greater amount of feed than others. Dutra [8] observed lesions in cattle that received 0.4%, 0.5% and 0.8% PC of DRB, however these data refer to spontaneous outbreaks in which the dose of DRB ingested by the animals was not controlled.

Based on these results, it is recommended that DRB be administered to cattle in doses no greater than 0.5% of BW. With this amount, if lesions are observed, feeding with DRB should be stopped immediately. If there is no control over consumption per animal, animals that show any clinical signs should be removed from the herd and fed individually with 0.5% BW or less DRB or with another ration. Another alternative is to use DRB to prepare balanced rations containing other elements. In Uruguay, the frequency of DRB poisoning has decreased in recent years, probably because of the marked increase in cattle fattening in feedlots, DRB is used to prepare balanced rations and no longer as a sole supplement (Fernando Dutra Personal communication).

In the present experiment, no difference was observed in the time elapsed between the start of DRB ingestion and the appearance of lesions in the groups. In spontaneous cases of poisoning, a period of 8-40 days was observed for the appearance of lesions after the start of DRB supplementation. It has been mentioned that there are numerous risk factors for the occurrence of the disease that could interfere in the period between the start of ingestion and the appearance of lesions [8]. Individual susceptibility, age, level of consumption and lack of adaptation of animals to DRB would be risk factors for the onset of the disease [9]. Apparently, there was no influence of adaptation to DRB on the appearance of lesions in the cattle in the present study, since they appeared in both groups (adapted and non-adapted) at the same time.

Regarding age, in a study carried out in Uruguay the author mentions that animals over three years old and adult cows are more susceptible to the disease. [4, 8]. In the present work, the average age of the cattle was 2.4 years, which is in accordance with what was observed in the spontaneous outbreaks diagnosed in the area of influence of the LRD/UFPel. Apparently, young cattle are as susceptible as steers and cows over three years of age. In one of the spontaneous cases, 50% of the 16-month-old animals presented lesions and, in another, only four-month-old calves became ill.

It is worth noting that three cattle did not present macroscopic lesions, but histologically, discrete perivascular dermatitis with some eosinophils was observed,

indicating that the animals had initial lesions and that they could develop macroscopic lesions if they continued to ingest DRB.

In the present study, there was no significant difference in the weight variation of the experimental cattle. This may be due to the suspension of DRB shortly after the appearance of the lesions and/or to the short time of bran ingestion by cattle (22 days). A study carried out in Uruguay with bran doses similar to those administered in this experiment, but for a longer period of time, also resulted in non-significant weight losses. In these experiments the author observed that after recovery from injuries, the cattle showed weight gains but also there were no significant differences compared to the controls. For these reasons, it is suggested that the disease does not interfere with cattle productivity [4].

The experimental cattle presented normal parameters in the blood counts, with no differences compared to the control cattle, as reported in previous studies of the disease [6, 7, 8].

The results of the Elisa test were inconclusive, with no significant increase in IgE levels being observed in the serum of the animals tested, with the exception of one bovine from Group 1 (#4) and another from Group 2 (#7) (Table 2). There was slight variation between the experimental groups and within each group. It is mentioned that the increase in IgE is directly related to the increase in inflammation reaction in cases of food allergy [11, 13], However, the cattle in Group 2 that showed an increase in IgE in the second week did not show macroscopic lesions and in the biopsies there was a mild histological lesion. In contrast, cattle with severe macroscopic and histological lesions did not show an IgE increase. The literature states that animals with food allergy do not always have high levels of IgE [11]. Other studies on the disease also did not reveal an IgE increase in the serum of affected animals [6, 8]. It has been reported that allergic diseases are categorized into three forms: those dependent on immunoglobulin E (IgE); those mediated by cells (without detectable IgE antibodies); and disorders with mixed IgE and non-IgE dependent mechanisms [14]. It is possible that the mechanism of DRB dermatitis falls within the mixed mechanism, since eosinophils were observed in most experimental cases in the present study.

These results are similar than those obtained by Dutra [8] and Dutra and Cesar [9] who suggested that the disease has and allergic basis associated with the development of Type I hypersensitivity. Some foods have been associated with dermatosis of probably allergic origin,

including sweet potato, distillers malt, coconut cake, rice bran, beet pulp, sesame meal, soybean cake, and cottonseed cake [8, 15]. However, in all these dermatitis the involvement of an allergic pathogenesis has not been demonstrated. The IHQ result that detected T lymphocytes in skin lesions, which are associated with type IV hypersensitivity, is noteworthy. The onset of the disease in a prolonged period of time after the start of DRB administration to animals also refers to type IV hypersensitivity, since type I hypersensitivity tends to be an acute disease with sudden onset.

5. Conclusion

It is concluded that DRB causes skin lesions in cattle. However, especially in regions where rice cultivation is significant, it could be administered in a controlled way in doses up to 0.5% body weight, since its use could be advantageous in cattle feed due to its high nutritional value and low cost. It is likely that the pathogenesis of poisoning is associated with type IV hypersensitivity, since the presence of T lymphocytes in the lesions characterize cell-mediated hypersensitivity.

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Conflict of interest statement

The authors declare that there are no conflicts of interest.

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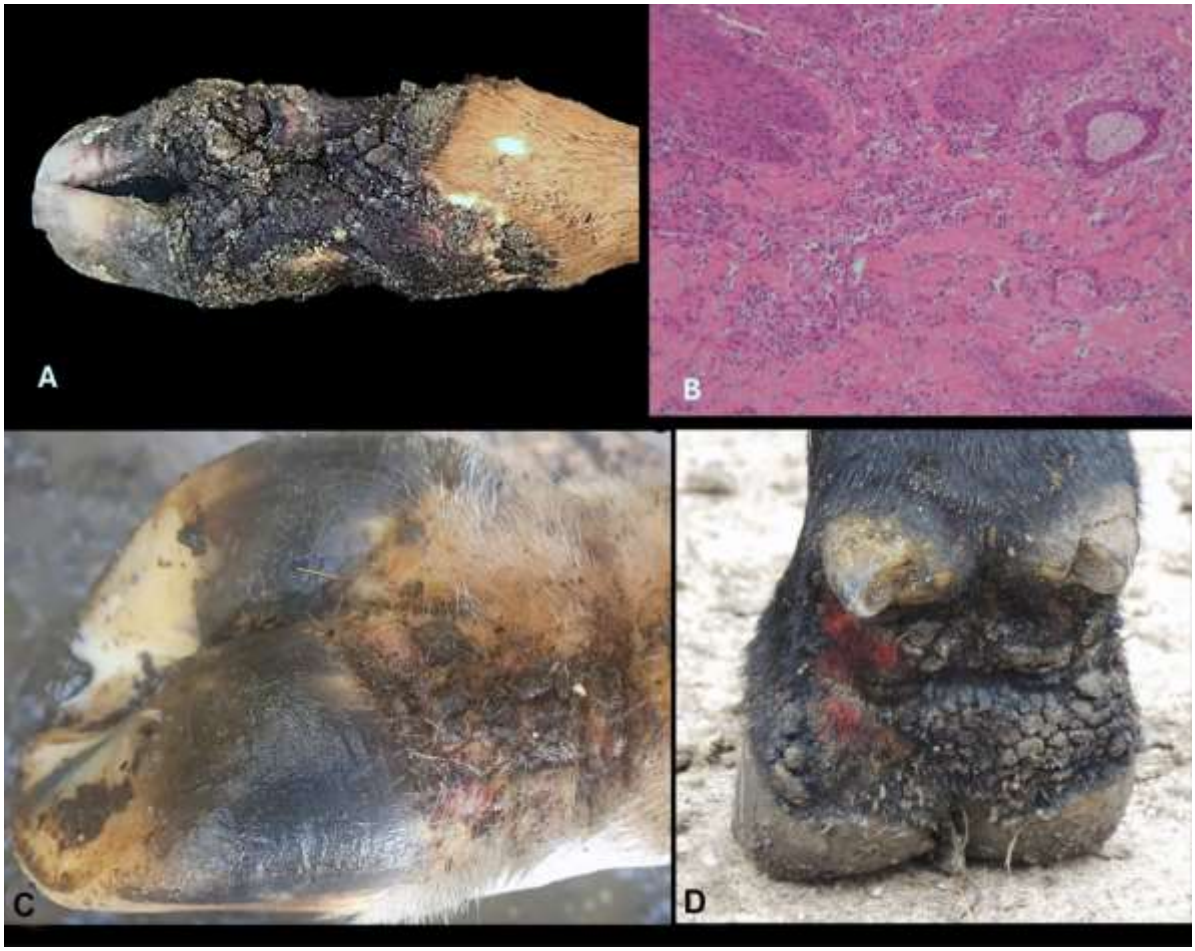

Figure 1. Defatted rice bran poisoning in cattle. **A.** Pastern region of a bovine hind limb showing severe proliferative dermatitis with crust formation and ulceration **B.** Histological lesion showing dermatitis with inflammatory infiltrate mainly of mononuclear cells HE X 20. **C.** Initial lesions of the poisoning characterized by edema, alopecia and crusts in of the plantar region of the pastern. **D.** Severe lesion with crusts, ulceration and areas of hemorrhage.

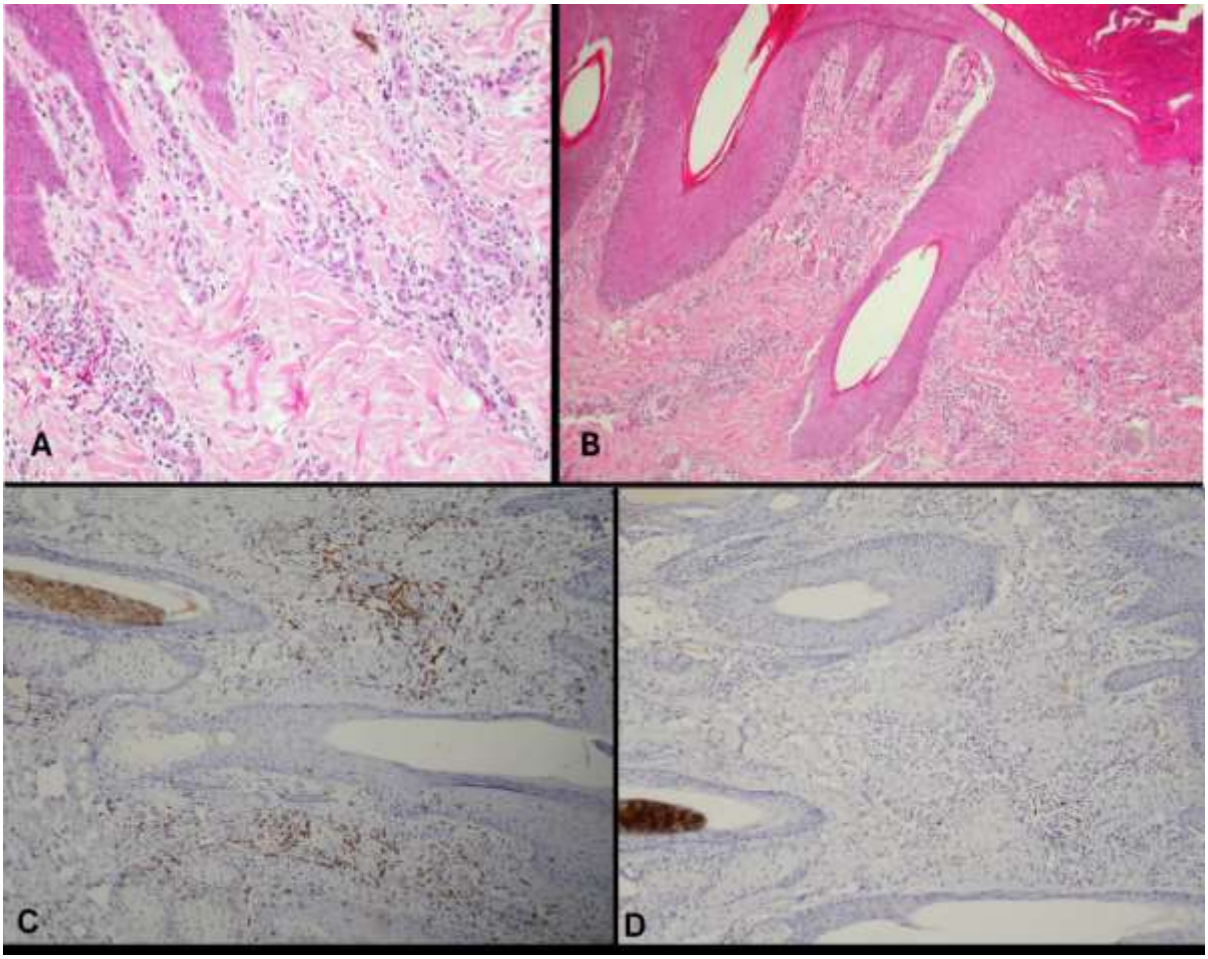

Figure 2. Defatted rice bran poisoning in cattle. **A.** Infiltrate of mononuclear inflammatory cells and scarce eosinophils mainly around the blood vessels in the superficial dermis HE X 20. **B.** A marked mixed inflammatory infiltrate of lymphocytes, neutrophils and a few eosinophils in the dermis and epidermis of cattle with more pronounced macroscopic lesions. HE X 10. **C.** Immunohistochemistry of T-lymphocyte-positive skin lesions using CD3 antibody, Dako. **D.** Immunohistochemistry of skin lesions negative for B lymphocytes using PAX 5 antibody, Dako.

Table 1. Epidemiological data on outbreaks of defatted rice bran dermatitis diagnosed in the southern region of RS

Outbreak [1]	Age (months)	Time of year	Criação	Incubation Time (days)	Morbidity %	% of DRB/BW[2]
1 a	30	July	feedlot	20	26	1
1 b	12-24	July	feedlot	35	20-30	1
1 c	12-24	July	Field reised	35	5	>1
2	24-36	September	Field reised	8	44	ND[3]
3	4	March	Field reised	30-40	6	ND
4	16	January	Field reised	20	50	0,08%

[1] Outbreak 1 comprised three groups of cattle from the same farm.
[2] BW= body weight
[3] ND= not determined

Table 2. IgE levels in (OD/nm) in the ELISA test in cattle fed defatted rice bran (DRB).

Bovine #/Group	Dilution 1-100			
	OD[2]	D1	D2	D3
1/ G1[1]	0,084	0,086	0,167	0,094
2/ G1	0,184	0,128	0,113	0,118
3/ G1	0,091	0,127	0,095	0,112
4/ G1	0,112	0,091	0,11	0,374
5 /G1	0,117	0,081	0,125	0,097
6 /G2	0,099	0,105	0,111	0,092
7 /G2	0,097	0,089	0,433	0,12
8 /G2	0,129	0,101	0,117	0,098
9 /G2	0,154	0,103	0,085	0,097
10 /G2	0,097	0,111	0,098	0,137
11 /G3	0,095	0,093	0,102	0,111
12 /G3	0,093	0,102	0,136	0,13
13/ G4	0,103	0,097	0,107	0,086
14/ G4	0,083	0,09	0,078	0,086
Mean OD/nm	0,109	0,100	0,134	0,125

[1]G1 – 1% to 2% DRB; G2 – 1% to 1.8% DRB; G3 – 0.5% DRB; G4 – control group
[2]OD= optical density day 0; D1= first week; D2 second week; D3 third week

Table 3. Mean and standard deviation of the cattle weight at the beginning of feeding with DRB, on the 17th day after the beginning and at the end of the experiment on the 22nd day.

Bovine Group	Day 0	Day 17	Day 22
		Weight	
G1	343,2 ± 8,8 a	334,8 ± 12,3 a	326,6 ± 10,6 a
G2	316,4 ± 17,9 a	303,6 ± 21,6 a	310,4 ± 26,7 a
G3	411 ± 53,7 a	413,5 ± 50,2 a	415,5 ± 26,2 a
G4	391,5 ± 26,2 a	365 ± 38,2 a	384,5 ± 53,1 a

G1 – 1% to 2% DRB; G2 – 1% to 1.8% DRB; G3 – 0.5% DRB; G4 – control group. Averages followed by the same letters in line have no statistical difference ($p > 0.05$).

2.2 Artigo 2

Cutaneous diseases diagnosed in cattle in southern Brazil from 2000 to 2022

Fabiano da Rosa Venancio, Taina dos Santos Alberti, Thais Martins Engelmann, Eliza Simone Viégas Sallis e Ana Lucia Schild

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Cutaneous diseases diagnosed in cattle in southern Brazil from 2000 to 2022[1]

Fabiano da Rosa Venancio [2], Taina dos Santos Alberti[3], Thais Martins Engelmann[4], Eliza Simone Viégas Sallis [5] & Ana Lucia Schild [6]*

ABSTRACT.- Venancio F.R., Alberti T.A., Engelmann T.M., Sallis E.S.V. & Schild A.L. 2017. [Cutaneous diseases diagnosed in cattle in southern Brazil.] **Doenças de pele diagnosticadas em bovinos na região Sul do Rio Grande do Sul**. *Pesquisa Veterinária Brasileira* 44:e07458, 2024. Laboratório Regional de Diagnóstico, Faculdade de Veterinária, Universidade Federal de Pelotas, Campus Universitário s/n, Pelotas, RS 96010-900, Brazil. E-mail: alschild@terra.com.br

A retrospective study of skin diseases diagnosed in cattle between 2000 and 2022 was performed at the Laboratório Regional de Diagnóstico da Faculdade de Veterinária da Universidade Federal de Pelotas LRD/UFPel, with the objective of determining the main skin diseases that affect cattle in southern Brazil. Information regarding epidemiological data, lesions and diagnosis was collected. The diseases were grouped into infectious/inflammatory, toxic, nonneoplastic proliferative and neoplastic. The macroscopic aspects, distribution, histopathology and evolution of the lesions were obtained in the protocols, and the original diagnosis was preserved. The main skin diseases diagnosed during this period occurred during outbreaks and were infectious, with an emphasis on dermatophyllosis, papillomatosis and dermatophytosis, followed by hepatogenous photosensitization, which was included in the group of toxic diseases. Among the neoplasms, squamous cell carcinoma stood out, occurring in isolated cases, reflecting an irrelevant cause of economic losses.

INDEX TERMS: cattle, dermatophilosis, dermatophytosis, dermatopathies, epidemiology, photosensitization, papillomatosis.

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[2]Programa de Pós-graduação em Veterinária, Faculdade de Veterinária (FV), Universidade Federal de Pelotas (UFPel), Campus Capão do Leão, Capão do Leão, RS, 96010-900
[3] Docente da Faculdade de Veterinária da Universidade de Cruz Alta (UNICRUZ), Campus Universitário, Cruz Alta, RS, 98020-290
[4] Graduação em Medicina Veterinária, Faculdade de Veterinária (FV), Universidade Federal de Pelotas (UFPel), Campus Capão do Leão, Capão do Leão, RS, 96010-900
[5] Departamento de Patologia, FV, UFPel, Campus Capão do Leão, RS, 96010-900
[6] Laboratório Regional de diagnóstico, FV, UFPel, Campus Capão do Leão, Capão do Leão, RS, 96010-900
* Corresponding author: alschild@terra.com.br

RESUMO.- [Doenças de pele diagnosticadas em bovinos na região Sul do Rio Grande do Sul.]Foi realizado um estudo retrospectivo das enfermidades de pele diagnosticadas no Laboratório Regional de Diagnóstico da Faculdade de Veterinária da Universidade Federal de Pelotas LRD/UFPel, no período entre 2000 e 2022, com o objetivo de determinar as principais dermatopatias que afetam bovinos na região Sul do RS. Foram coletadas informações referentes aos dados epidemiológicos, lesões observadas e ao diagnóstico. As enfermidades foram agrupadas em infecciosas/inflamatórias, tóxicas, proliferativas não neoplásicas e neoplásicas. Os aspectos macroscópicos, distribuição, histopatologia e evolução das lesões foram obtidos nos protocolos e o diagnóstico original foi preservado. Conclui-se que as principais enfermidades cutâneas diagnosticadas no período ocorreram em surtos e eram infecciosas, destacando-se a dermatofilose, a papilomatose e a dermatofitose, seguidas pela fotossensibilização hepatógena incluída no grupo das enfermidades tóxicas. Dentre as neoplasias destacou-se o carcinoma celular escamoso que ocorreu em casos isolados, refletindo irrelevante causa de prejuízo.

TERMOS DE INDEXAÇÃO: bovinos, dermatofilose, dermatofitose, dermatopatias, epidemiologia, fotossensibilização, papilomatose.

INTRODUCTION

In ruminants, skin diseases are responsible for intense discomfort and can manifest as pruritic, alopecic, nodular or crusted lesions that occur as a result of primary involvement of the skin or secondary damage to other systems (Scott 2018). Most of these diseases occur in different species of ruminants and may present variations in the severity of the lesions and the evolution of clinical signs, causing variable economic losses (Macedo et al. 2008, Faccini et al. 2022).

Among Brazilian states, Rio Grande do Sul is currently the 7th largest cattle producer in the country (IBGE 2017). The meat and milk production chain in the State of Rio Grande do Sul has great economic–social importance and power for regional integration, with the possibility of increasing added value from its byproducts (IBGE 2017). For these reasons, the health of livestock is fundamental and includes skin diseases, as these, in most cases, despite not being causes of death, lead to considerable economic losses due to the costs of veterinarians, medication and labor. Furthermore, there are important losses in terms of the performance of affected animals in the production of milk, meat and other derivatives.

These skin diseases can have different etiologies and among them are those related to nutritional problems (Hensel 2010), infectious agents (Pereira & Meirelles 2023a, Motta et al. 2010, Foster 2012, Panziera et al. 2016, Soares et al. 2017, Bertagnolli et al. 2019), neoplasms (Reis et al. 2017), those associated with allergic processes (Dutra 1998, Santos et al. 2021, Schild 2023) and those caused by the action of toxic agents (Knupp et al. 2016, Santos et al. 2017, Amado et al. 2018, Mendonça et al. 2021).

Several studies carried out throughout Brazil related to skin diseases in ruminants and horses reveal that the prevalence of these diseases varies considerably according to the study region (Salles et al. 1992, Casagrande et al. 2008, Knupp et al. 2016, Reis et al. 2017, Amado et al. 2018). Therefore, retrospective and prospective studies of the different skin diseases that affect these animal species in different regions of the country are essential for determining their epidemiology, pathogenesis, pathology and prevalence and helping field veterinarians and rural producers control and prevent these diseases, reducing the losses they cause in livestock production (Lucena et al. 2010, Rondelli et al. 2017, Amado et al. 2018).

The objective of this work was to carry out a retrospective study on skin diseases that affect cattle in the region of influence of the Laboratório Regional de Diagnóstico da Faculdade de Veterinária da Universidade Federal de Pelotas (LRD/UFPel) over a period of 22 years to determine under which epidemiological conditions they occur, in addition to describing the pathology and pathogenesis of these diseases, helping to prevent and control them and thus minimizing the losses caused to regional livestock farming.

MATERIALS AND METHODS

A retrospective study of skin diseases diagnosed at LRD/UFPel between 2000 and 2022 was carried out. Information regarding epidemiological data (species, breed, sex, age, distribution of lesions and time of year of occurrence) and diagnosis was collected from the LRD necropsy protocols. The diseases were grouped into inflammatory/infectious, toxic, nonneoplastic proliferative and neoplastic. The affected animals were classified as calves up to 12 months old, steers 13 to 24 months old, young adults aged 25 to 60 months, adults aged between 61 months and 10 years (beef and cow) or elderly individuals older than 10 years old. The macroscopic aspects, distribution, histopathology and evolution of the lesions were obtained in the protocols, and the original diagnosis was preserved. When necessary, paraffin blocks were retrieved from the LRD/UFPel collection to

perform special staining and IHC techniques to complement the characterization of the lesions and the diagnosis.

RESULTADOS

In the period between January 2000 and December 2022, 4,067 materials/cadavers of the bovine species were received from the LRD/UFPel, 150 (3.7%) of which were diagnosed as having diseases of the integumentary system. During this period, 100 (66.6%) of the 150 materials were investigated via biopsy, 20 (13.3%) of the materials were investigated via autopsy, and 27 (18.0%) of the materials were other materials, such as skin scrapings, hair, and swabs from skin lesions that were analyzed for bacterial and fungal culture.

Of the 150 cases/outbreaks, 102 (68.0%) were diagnosed in females, 39 (26.0%) in males and nine (6.0%) did not have this information in the necropsy protocols. Regarding age, 19 (12.7%) materials were diagnosed in cattle up to 12 months old, 31 (20,7%) from 12 to 24 months, 25 (16,7) from 25 to 60 months, 47 (31.3%) from 61 months to 10 years, six (4.0%) older than 10 years, and 21 (14.0%) for whom age was not included in the necropsy protocols. Of the 150 diagnoses of skin diseases, 82 (54.7%) individuals had inflammatory or infectious lesions, 39 (26.0%) had neoplasms, 23 (15.3%) had skin diseases of toxic origin, and six (4.0%) had no neoplastic proliferative skin diseases. The diagnoses of the 150 cases/outbreaks and a summary of the epidemiology are presented in Table 1.

The cases of dermatophilosis occurred mainly in spring (10 cases); the others were distributed in summer and autumn, with four cases each, and three cases occurred in winter. Most of the affected cattle were under 12 months of age (13 cases), and in three cases, the cattle were older than 1.5 years. In seven cases, the lesions were widespread. In the remaining cases, the lesions were located on the hind limbs (3 cases), back (3 cases), face and neck (2 cases), and in one case, the lesion was observed at the insertion of the tail. In five cases, there was no information on the location of the lesions in the necropsy protocol. The lesions were characterized by hyperplastic dermatitis with disseminated crusted plaques, areas of alopecia and wrinkling of the skin (Fig. 1). These injuries were similar in all cases, with greater or lesser distributions and severities.

Out of the 17 cases of papillomatosis, seven had more than one affected animal on their farm, and 10 had individual cases. The distribution of the lesions varied, and in five cases, the lesions were widespread; four were on the head and neck, three were on the

limbs, and one was on the udder. In four cases, the location of the papilloma was not mentioned in the protocol. Most of the affected cattle were up to 24 months of age. Among the 17 cases, the disease affected between two and 17 animals, with a prevalence varying from 3.33% to 33.3%.

Dermatophytosis was diagnosed mainly in winter (six diagnoses), and the remaining cases were diagnosed in summer (three cases) or spring (two cases), while one case was diagnosed in autumn. Ten outbreaks of this disease and two individual cases were observed. The age of the affected cattle varied from one-month-old calves to adult cattle. The prevalence of this disease ranged from 5% to 100% of the animals in the affected herds.

During the period studied, four cases of proliferative fibrogranulomatous panniculitis (lechiguana) were diagnosed, all in municipalities in the LRD/UFPel influence region on properties with native forest. The affected animals were two to four years old, and the tumors were located in the mandibular region, in the left lateral region of the thorax, in the scapula region and in one patient. The lesion was observed in the region of the hind limb. In two cases, the tumors measured 35x28x11 cm and 33x33x19 cm. In two cases, biopsies were sent, and it was not possible to determine the size of the tumors.

Pythiosis was observed in four-year-old cattle aged one and a half years, all in the summer months; it affected the distal region of the limbs in two outbreaks and in one individual case and the limbs and snout of the animals in another outbreak. In all four cases, the animals remained in low-lying and marshy areas. The lesions in all affected cattle were characterized by ulcerated and hemorrhagic areas (Fig. 2) that resolved spontaneously.

Of the 31 diagnoses of squamous cell carcinoma (SCC), 25 occurred in the Holstein breed, two in crossbred animals, two in the Braford breed and two in which the animal's breed was not included in the necropsy protocol. Of the 31 SCC diagnoses, 16 occurred in the periocular region, 13 occurred in the perineal region, and in two cases, there was no information on the location of the tumor in the protocol. Most of the affected cattle were older than six years, except for one that was two years old, another that was four years old and another that was five years old.

Seventeen photosensitization outbreaks were diagnosed during the study period, 15 of which were classified as hepatogenous photosensitization and two as primary photosensitization. The two primary photosensitization outbreaks occurred in spring.

Out of the 15 outbreaks of hepatogenic photosensitization, five occurred in spring, five in autumn, four in summer and one in winter. Cases of hepatogenic photosensitization occurred in areas of native grassland, rice or soybean stubble, and ryegrass and oat pastures. The lesions were characterized by mucopurulent ocular discharge (Fig. 3), peeling of the snout and ulceration of the ventral surface of the tongue in animals with dark skin. In animals with areas of white skin, the lesions extended across these areas with ulceration, dryness and detachment of the epidermis. Primary photosensitization occurred in two rice stubble plants, where *Polygonum* sp. was present in moderate amounts. The disease affects different categories from 10 months of age to adult animals. Morbidity during outbreaks ranged from 0.43% to 40%, and mortality ranged from 0.05% to 3.7%.

Three outbreaks of poisoning by *Ramaria flavo-brunnescens* were diagnosed in the study period. Morbidity ranged from 35% to 37% and lethality ranged from 16% to 36%. The outbreaks occurred between April and May in cattle that were in eucalyptus reforestation areas. Skin lesions were characterized by loss of long tail hair and loosening of the horns, in addition to other lesions that affected the oral mucosa, esophagus and rumen papillae.

Dermatitis due to the consumption of defatted rice bran (DRB) was diagnosed on three occasions. The prevalence of rot was 6%, 44.4% and 50% in the animals that were in native fields and began to receive defatted rice bran mixed with feed in different proportions. The affected cattle were between four months and three years old. In one of the outbreaks, DRB, which also included soybean hulls, soybean bran, wheat bran and ground corn, represented 0.08% of the feed administered. In the other outbreaks, the composition and quantity of DRB administered to cattle were not included in the protocols. The lesions began to appear eight days, 20 days and 30-40 days after the three outbreaks, respectively, and were generally characterized by proliferative dermatitis that began in the pastern region, accompanied by the formation of crusts and cracks in the skin (Fig. 4). The lesions regressed within a few days after bran was removed from the diet in all the outbreaks.

The number of patients diagnosed with other skin diseases was insignificant, and the illnesses all manifested themselves as individual cases.

DISCUSSÃO

The 150 cases of diseases of the integumentary system diagnosed in cattle from 2000 to 2022 in the LRD/UFPel represented 3.7% of all performed diagnoses. These findings demonstrated that these diseases are important in the region, mainly because the most common were infectious and inflammatory diseases, which represented more than half of the cases of skin diseases (54.7%). In Brazil, there is little information on the prevalence of skin diseases in cattle, with reports of only specific diseases and isolated outbreaks (Gabriel et al. 2008, Leal et al. 2017, Soares et al. 2017, Reis et al. 2017, Mendonça et al. 2021).

In the present study, dermatophilosis was the main skin disease that affected cattle, occurring mainly in the spring and represented 15% of all skin cases that were received at LRD/UFPel during the study period. This fact is probably related to the climate, since in the LRD/UFPel region of influence this season of the year, humid days occur with frequent rains interspersed with sunny periods. Dermatophilosis commonly occurs in hot tropical and subtropical regions that have a long rainy season (Pereira & Meireles 2023a). It has been mentioned that dermatophilosis is associated with climate factors and other stressful factors, such as weaning, lack of food and inadequate management, which can also predispose animals to the development of this disease (Pereira & Lemos 2023). In the present study, the majority of affected animals were young and were subjected to management, such as weaning, vaccinations and deworming, which may have contributed to the emergence of outbreaks.

The second most common infectious/inflammatory disease was papillomatosis. This disease is associated with different subgroups of the papilloma virus, totaling 29 distinct types involved in its etiology (Schuch 2023). On the other hand, the presence of the virus in the southern region of Rio Grande do Sul is evidenced by the significant number of cases of equine sarcoid diagnosed in the same period (Venancio et al. 2022), which is greater than the number of cases of bovine papillomatosis. This can be explained by the fact that bovine papillomatosis is a self-limiting disease (Goldschimidt & Hendrick 2002, Schuch 2023) and is easily recognized by veterinarians, owners and rural workers. This apparently influences the reduced number of samples sent to the laboratory for diagnosis. According to data from the Laboratório de Virologia, Faculdade de Veterinária, UFPel, between 2013 and 2023, 38 papillomas were received directly to produce vaccines (Paulo C. Rodrigues 2023, unpublished data), which confirms this hypothesis. Notably,

several individual cases were diagnosed, which is not expected for an infectious disease. This, however, must be considered with caution since, in many cases, epidemiological information arrives at the laboratory incomplete and can lead to errors in its evaluation.

Dermatophytosis was observed with a random distribution affecting different regions of the bovine body. The regions of the head and neck that spread to the trunk, limbs and tail are the regions most frequently affected by this disease (Pereira e Meireles 2023b); however, in the present study, the lesions were also observed in the ventral and lateral regions of the chest and perineum. The highest frequency of the disease occurred in spring and summer, when the temperature and humidity are more suitable for the development of the fungus. The disease occurs mainly in tropical and temperate regions with hot and humid climates (Pereira & Meireles 2023b). On the other hand, these authors mention that outbreaks in Rio Grande do Sul occur more frequently in the autumn and winter months, which was not confirmed in the cases diagnosed in the LRD.

The low number of lechiguana (paniculitis) cases observed between 2000 and 2022 in the region where the disease was first diagnosed and studied since 1986 (Almeida 1986, Ribeiro et al. 1989, Riet-Correa et al. 1992, Pereira et al. 2000, Ladeira et al. 2006, Ladeira et al. 2010) is apparent because this disease has become well known by professionals in the field and because treatment with antibiotics allows the affected animals to recover completely, despite the size of the tumors and the intense proliferation of fibrous tissue that characterizes the lesion. All the patients diagnosed in the present study came from farms where there were areas of native forest, which favors the presence of *Dermatobia hominis*, which is involved in the transmission of *Manheimia granulomatis*, the bacteria responsible for the etiology of the disease (Ladeira et al. 2010). The lesion is characterized by a pronounced increase in volume, mainly in the anterior regions of the body, such as the shoulders and neck, and can occasionally be observed in the jaw (Ladeira et al. 2010).

In the present study, pythiosis was diagnosed in the study region on four occasions. In two outbreaks, the prevalence ranged from 22.4% (Grecco et al. 2009) to 4.0% (Eliza Simone V. Sallis, dados não publicados). This seems to demonstrate that despite not causing deaths and resolving spontaneously, the disease can cause some damage due to the relatively high prevalence of some outbreaks, costs associated with treating secondary infections or transferring animals to other areas with a decreased possibility of *Pythium insidiosum* infection, increasing the need for additional work.

Regarding bacterial dermatitis histologically, in most cases, the lesions were characterized by pyogranulomatous or suppurative inflammation with the presence of bacterial colonies. The fact that most of the materials in these cases were already formalized did not allow the identification of the agents, which demonstrates the need to use fresh materials for bacterial culture.

In the present study, SCC was the most common neoplasm, with a higher incidence than the others, accounting for 79.5% of cutaneous neoplasms diagnosed in cattle, corroborating what has been described in other regions of the state and country (Reis et al. 2017, Rondelli et al. 2017). SCCs were observed mainly in the periocular and peri vulvar regions, as observed by Reis et al. (2017) in a survey of neoplasms diagnosed in cattle at SPV-UFRGS. The occurrence of SCC in these anatomical regions is related to skin depigmentation in these areas and because they are more exposed to solar ultraviolet radiation. Females were most affected, probably because they are more common on farms, and the Holstein is the breed *most common in the dairy basin in southern Brazil.*

In this study, 15 cases of hepatogenic photosensitization did not have an identified etiology; these cases involved both pasture areas, such as ryegrass and oats, and areas of native grassland or rice and soybean stubble. A study carried out on the LRD/UFPel between 1984 and 1997 did not identify the cause of the disease in 19 outbreaks but established the different types of fields where the disease occurred (Motta et al. 2000). The present paper demonstrated that the disease continues to occur in the same areas without identifying its etiology and with variable morbidity and mortality, more frequently in spring and autumn, in the same way as described by Motta et al. (2000). Hepatogenic photosensitization probably has a multifactorial etiology, and for this reason, identification of this condition has not been possible. Climatic factors, in addition to the type of soil and vegetation, may be associated with the onset of the disease. In southern region of Rio Grande do Sul, several plants cause hepatogenic photosensitization, including *Brachiaria decumbens, Enterolobium contortisiliquum, Lantana camara, Panicum* spp*.,* and *Myoporum laetum* (Lemos & Pupin 2023), however these hepatotoxic plants were not observed in outbreaks here described. Primary photosensitization has been shown to be of little importance as a skin disease in cattle, however it must be taken into consideration in the differential diagnosis between cases of photosensitization. In general, in these cases the disease is discreet, and the cure is spontaneous if the cattle are placed in shady areas. In the region of this study, *Ammi majus* is the only plant known to

cause primary photosensitization. It occurs in spring and invades cultivated areas (Méndez et al. 1991) but has not been identified in areas where the outbreaks described in this paper have occurred.

The three outbreaks of poisoning by *R. flavo-brunnescens* occurred in a municipality in the southern region of Rio Grande do Sul where there is a large reforestation area with eucalyptus where cattle are grazed. Raising cattle in a silvopastoral system has increased the risk of this poisoning (Alves et al. 2014). However, outbreaks of this poisoning are not frequent, since the poisoning is well known by owners and professionals and in addition the mushroom does not always occur in eucalyptus forests. The climate, soil and the type of forest planted may also determine the presence or absence of the mushroom in the area (Scheid et al. 2022).

Dermatitis caused by DRB affects cattle, the prevalence of which reaches 50%. Despite the small number of outbreaks, this disease is important due to the number of animals affected and secondary infections that, in some cases, can lead to the death of animals (Schild & Venancio 2021).

Other skin diseases such as *Vicia* spp. and poxvirus infection were not diagnosed in the LRD/UFPel area of influence during the study period, however they have been diagnosed in other regions of the State and should be taken into consideration in the differential diagnosis of skin diseases in cattle (Barros et al. 2001, Sonne et al. 2011, Cargnelutti et al. 2012).

CONCLUSÕES

The results of this study allowed us to conclude that skin diseases of an infectious and/or inflammatory nature represented more than half of the cases of skin diseases diagnosed in cattle. In this group of diseases, dermatophyllosis, papillomatosis and dermatophytosis should be considered causes of economic losses for livestock in the region. Among the toxic causes of skin diseases, hepatogenic photosensitization of unknown cause occurs frequently in different types of pastures and native fields. Despite the significant number of SCCs in relation to other diagnoses, most of the time, they are isolated cases and are not a relevant cause of damage to livestock in the region.

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Figures

Figure 1. Dermatophilosis in cattle. Hind limb with plates of varying sizes covered by crusts. There are areas of alopecia and roughness of the skin.

Figure 2. Pythiosis in cattle. Ulcerated lesion with hemorrhage in the right supranasal region.

Figure 3. Hepatogenic photosensitization in cattle. Mucopurulent ocular discharge and scaling of the periocular area.

Figure 4. Dermatitis due to defatted rice bran in cattle. Proliferative lesion with crusts and cracks in the skin of the pastern region in a cattle.

Table1. Skin diseases diagnosed in Southern Brazil between 2000 and 2022 at the Regional Diagnostic Laboratory of the Federal University of Pelotas

Infectious/inflammatory	**Number**	**%**
Dermatophilosis	22	26,8
Papillomatosis	17	20,7
Bacterial dermatites	13	15,8
Dermatophytosis	12	14,6
Lechiguana	4	4,9
Pythiosis	4	4,9
Botryomycosis	3	3,6
Pododermatitis	3	3,6
Parasitic dermatites	2	2,5
Viral udder dermatites	1	1,3
Folliculitis	1	1,3
Total	**82**	**100%**
Neoplasms	**Number**	**%**
Squamous Cell Carcinoma	31	79,5%
Fibrosarcoma	4	10,3%
Fibroma	2	5,1%
Melanoma	2	5,1%
Total	**39**	**100%**
Toxic	**Number**	**%**
Hepatogenic photosensitization	15	65,3%
Dermatitis due to defatted rice bran	3	13%
Ramaria flavo-brunnecens	3	13%
Primary photosensitization	2	8,7%
Total	**23**	**100%**
Others	**Number**	**%**
Acanthosis and hyperkeratosis	4	66,7%
Granulation tissue	2	33,3%
Total	**6**	**100%**

3 Considerações Finais

Esta tese permitiu determinar que o FAD pode causar lesões de pele em bovinos na dose de 1% do peso vivo ou mais e que a adaptação dos animais ao alimento aumentando gradativamente a dose até alcançar 1,8% do peso corporal não impediu a ocorrência das lesões. Além disso, o fato de que não se encontrou resultados robustos à cerca do aumento de IgE no sangue dos bovinos intoxicados deixa dúvidas em relação a esta intoxicação tratar-se de um processo de hipersensibilidade tipo I, que se apresenta de forma aguda. Além disso, não foi identificada nos cortes histológicos ou no hemograma a presença de mastócitos, que são células fortemente relacionadas à hipersensibilidade imediata.

A partir do estudo retrospectivo das doenças de pele que ocorrem em bovinos na região Sul do Rio Grande do Sul, desde o ano 2000 concluiu-se que devem ser levadas em consideração para o diagnóstico principalmente aquelas causadas por agentes infecciosos e tóxicos como a dermatofilose, a papilomatose, a dermatofitose e a fotossensibilização hepatógena, que são enfermidades que trazem prejuízos econômicos consideráveis aos produtores rurais da região.

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Anexos

Anexo A - Documento da Comissão de Ética e Experimentação Animal

PARECER Nº **7/2023/CEUA/REITORIA**
PROCESSO Nº 23110.025454/2022-65

Certificado

Certificamos que a proposta intitulada **"INTOXICAÇÃO POR FARELO DE ARROZ DESENGORDURADO EM BOVINOS: UMA ABORDAGEM ATUALIZADA, REPRODUÇÃO EXPERIMENTAL E PERSPECTIVAS"**, registrada com o nº **23110.025454/2022-65,** sob a responsabilidade de **Ana Lucia Pereira Schild** - que envolve a produção, manutenção ou utilização de animais pertencentes ao filo Chordata, subfilo Vertebrata (exceto humanos), para fins de pesquisa científica (ou ensino) – encontra-se de acordo com os preceitos da Lei nº 11.794, de 8 de outubro de 2008, do Decreto nº 6.899, de 15 de julho de 2009, e com as normas editadas pelo Conselho Nacional de Controle de Experimentação Animal (CONCEA), e recebeu parecer **FAVORÁVEL** a sua execução pela Comissão de Ética no Uso de Animais da Universidade Federal de Pelotas.

Finalidade	(x) Pesquisa ( ) Ensino
Vigência da autorização	Início: 05/03/2023 Término: 31/10/2023
Espécie/linhagem/raça	*Bos taurus* / Holandês/Jersey
N° de animais	**30**
Idade	15 meses
Sexo	Fêmeas
Origem	Cooperativa de Produção Agropecuária Piratini LTDA (COOPAVA), localizada no 2º distrito do município de Piratini/ RS, localidade Vista Alegre.

Código para cadastro nº **CEUA 025454/2022-65**

Priscila Marques Moura de Leon

Coordenadora da CEUA

Documento assinado eletronicamente por **PRISCILA MARQUES MOURA DE LEON**, **Professor do Magistério Superior**, em 10/02/2023, às 00:10, conforme horário oficial de Brasília, com fundamento no art. 4º, § 3º, do Decreto nº 10.543, de 13 de novembro de 2020.

A autenticidade deste documento pode ser conferida no site http://sei.ufpel.edu.br/sei/controlador_externo.php?acao=documento_conferir&id_orgao_acesso_externo=0, informando o código verificador **2044774** e o código CRC **7D272FAF**.

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