

Udder-Thigh Dermatitis of Cattle: Epidemiological, Clinical and Bacteriological Investigations

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Abstract

A skin condition affecting the medial thigh and udder of cows is described.

Clinical examinations and follow-up checks, an epidemiological survey, and bacteriological examinations were conducted. Results showed that the disease occurred mainly in primiparous cows with above average milk production around the time of first calving. Prerequisite for development of the udder-thigh dermatitis was pressure and friction between the two contacting skin surfaces. The results of the bacteriological examinations did not indicate a primary bacterial origin, but a secondary bacterial invasion of the lesions of intertrigo. The course of the disease is characterized by five stages, which partially overlap in time:

- erythema
- swelling and induration of the skin
- necrosis of superficial skin layers
- sloughing of skin and to some degree the subcutis
- healing phase with granulation and reepithelialization.

The lesions in all 41 observed cases healed within the course of 4-12 weeks. The frequency of the condition amounted to approximately 1% in first calf heifers and 0.06% in older animals.

Introduction

During the last several years cows with inflammatory changes of the skin of the groin between the medial thigh and udder have repeatedly been admitted to the clinic for inpatient treatment. The affected animals were noticed by the owners or milkers because of the unpleasant odor which arose from these lesions.

The available literature contains only sparing reports about this problem; only one single case is described concretely and brief references were found in two veterinary texts (BLOOD *et al.*, 1979, and SIEGMUND, 1979). The

disease, however, was familiar to almost all practicing veterinarians consulted on the matter. It therefore seemed appropriate to conduct systematic investigations on this illness.

It was attempted to look into the following questions:

- Estimation of the frequency of occurrence of the disease and determination of possibly significant epidemiological factors.
- Exact report of the clinical manifestations and observations of the course of the disease.
- Comparison of the aerobic bacterial flora of the affected area of the skin with that of the udder-thigh cleft of healthy animals.

Materials and Methods

Systematic investigation of the frequency of occurrence of the problem in animals going to slaughter was accomplished by reviewing 1800 cows at the city slaughterhouse of Munich from October 1979 through January 1980. Further, the owners of 70 randomly selected milking herds, with a total of 2150 calvings per year, provided information by means of a telephone survey concerning the occurrence of the problem in their herds within the last three years, as well as the frequency of recurrence. The herds of origin of the cases to be described later were not included in this survey, in order to avoid a selection.

The diseased animals (n=41) were either clinic patients or were reported for ambulatory examinations by cooperating practitioners. A general clinical examination and a special examination of the udder-thigh clefts were conducted on all animals. Follow-up visits were carried out on the ambulatory cases twice a week until the healing phase was underway, after which once a week visits were conducted.

Udder shape was assessed following the criteria of BOGE (1965) after the periparturient udder edema had subsided (*Fig. 1*).

The following data were also recorded concerning the herds of origin of these animals: type of housing, production level of the animal (from the milk production test data), degree of udder edema at calving (as judged by the owner), and time of detection of the disease.

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From 36 patients a total of 41 culture swabs were collected from the groin between the udder- and medial thigh. A total of 15 culture swabs were taken from 9 healthy animals of approximately the same age, and in a comparable stage of lactation. These swabs were rolled out on the following culture media: nutrient agar, blood agar (7% sheep blood) and GASSNER's agar (a selective agar for enterobacteriaceae). Finally the swab was immersed in a tube of nutrient broth. The cultures were incubated for 48 hours at 37° C, and in cases where negative cultures or little bacterial growth were found on the agar plates, subcultures were streaked on the same three media from the broth.

Rough estimations of the bacterial concentrations were made based on the density of colony growth on the solid media, and were assessed as + to ++++ (Table 2).

Results

Epidemiological Investigations: None of the 1800 cows examined at the Munich city slaughterhouse showed skin changes in the groin. The survey of the milking herds revealed that a total of 18 cases of this disease had occurred on 16 farms during the preceding three years (from the beginning of 1978 till the end of 1980). 15 of these cases were heifers after the first calving. Two cases concerned cows with reoccurrence following the second calving and one case was a cow at third lactation. 6450 calvings were included in the survey, of which 1520 were first calvings and 4930 were in older cows. The frequency of occurrence of the disease based on these figures amounted to approximately 1% in first calf heifers and 0.06% in older cows.

Of the 41 affected animals examined, 38 were heifers at first calving and the remaining 3 animals were 3½, 5 and 7 years of age. All of these patients were housed in tie stalls year round.

The milk production of the 34 German Fleckvieh heifers under investigation amounted to 19.2 l/day. The committee of the State Producer's Association lists the average milk production of Simmental first calf heifers as 16.2 l/day for the year 1980.

According to the reports of the owners, 26 of the animals had displayed marked to severe udder edema peripartum, while the edema in 4 of the patients was classified as normal. No report on the degree of udder edema could be obtained for the remaining cases (some of these had been purchased shortly after calving).

It was seen, in regard to the time of occurrence of the disease, that the illness was noticed in 36 of the 41 patients within the first 25 days post partum. The remaining cases came to attention by the end of the fifth week.

By the conclusion of the investigations (March 1981), 13 of the 41 patients had calved the second time. Two of these animals showed recurrence, though to a much milder degree than the first time.

General Clinical Findings: The general health of the patients was undisturbed in all cases. Body temperature remained within physiological normal limits without exception. Eighteen animals had enlarged iliofemoral lymph nodes. Five of these, which had especially severe lesions in the groin, also had enlarged subiliac lymph nodes. Four animals displayed mange-like skin changes in the escutcheon region, but the skin scrapings taken from these areas and examined microscopically were negative in all cases. No remarkable findings were otherwise identified, aside from the specific dermatitis lesions.

The distribution of the patients by individual udder shape classification is presented in figure 1.

Visual evaluation of the milk revealed no indication of disease of the mammary gland parenchyma in any of the animals.

Findings in the Groin: Although the udder edema had subsided in all of the animals at the time of the initial examination, remarkably strong pressure still existed between the udder and medial surface of the thigh, where they were in contact.

The lesions in the groin were present bilaterally in 21 of the cows. Since the disease did not develop simultaneously on both sides in all of these cases, the course of the disease on one side could be observed from its inception in four of the animals. This allowed five stages to be more or less clearly distinguished from one another. These are described as follows:

- (1) The beginning stage is characterized by increased sweat production as well as circumscribed reddening of the skin with increased warmth. There is no swelling, however, and apparently only minor pain.
- (2) Within the next 2-3 days the skin swells, and becomes firm, superficially greasy and pale.
- (3) After 3-6 days an unpleasant odor arises. A greasy mass consisting of shedded hair, dead skin and dirt builds up in the area of chafing. Several days later a slightly raised, reddish band on the edge of the sharply demarcated gangrenous region is observed.
- (4) The necrotic skin separates from the border of the affected area and is sloughed. Extensive skin flaps loosen from the deeper layers (Fig. 2). In the central area, the pressure zone of the udder and thigh skin, are fissure-like, mostly several centimeter deep holes in the tissue, from the edges of which necrotic shreds of skin hang. In this stage also, which may last up to six weeks depending on the severity of the lesions, there appears to be only minimal pain. During this demarcation of the lesion the development of granulation tissue begins, leading to
- (5) the healing phase, during which the skin defect granulates in. Reepithelialization begins from the edges (Fig. 3) Depending on the depth and extent of the lesion this process is finished after 4 to 8 weeks, with minimal scar formation, or possibly as late as three months. Healing occurred in all 41 patients.

Figure 1: Grouping of 41 cows with "Udder-Thigh Dermatitis" by udder shape according to the criteria of BOGE (1966)

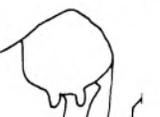
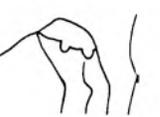
Udder-Shape	Number of patients	Udder-Shape	Number of patients
	22		1
Milk machine-belly-thigh udder		Saggy udder	
	9		2
Milk machine udder		step udder	
	3		0
Thigh udder		Goat udder	
	2		2
Belly-thigh udder		Deer udder	

Table 1 shows a listing of the patients according to the maximal extent and severity of the lesions. The lesions appeared either unilaterally (20 animals) or bilaterally, but in differing intensity (21 animals).

The results of the bacteriological investigations are presented in Table 2. There it can be noted that a gram positive flora was dominant in the healthy animals, if the one single isolation of Flavobacteria is overlooked. Predominantly non-specific Corynebacteria and Micrococci were detected. Gram-negative bacteria were found in the diseased animals, represented by *Escherichia coli* and *Proteus vulgaris* (total of 11 times). Despite this, the gram-positive flora was predominant here as well, with a total of 65 isolations. *Corynebacterium pyogenes* was demonstrable in 5 of the diseased cows. A total of 7 times non-hemolytic and α -hemolytic Streptococci were also found. But in the sick animals as well, Corynebacteria sp. and Micrococci were dominant, with a total of 45 isolations.

If the bacteria count is taken into consideration, it can be seen, surprisingly, that on the average no very high numbers of bacteria appeared in the diseased animals despite severe

skin lesions. Cases with mild and moderate degrees of bacterial growth (60 cases) far outnumbered cases with heavy and extreme bacterial growth (18 cases). Where high bacteria counts were found, both the diseased and the healthy animals showed almost exclusively Corynebacteria sp. and Micrococci. *Corynebacterium pyogenes* was cultured once in minimal numbers, twice in moderate, and twice in great numbers. *E. coli* and *Proteus vulgaris*, which would possibly come into question as the cause of the odor, were only demonstrable in minimal (4 times each) and moderate (1 and 2 times respectively) numbers. Subcultures from the broth were only utilized twice, but in both cases no additional information was obtained. The bacterial species isolated grew in pure culture 18 times, and 15 of these were Corynebacteria sp. Mixed cultures of 2 species developed 11 times, those of 3 species 10 times. Mixed cultures of 5 and 6 species appeared one time each. *C. pyogenes* grew in pure culture once, together with non-hemolytic Streptococci once, and with two other bacterial species three times (*Corynebacterium* sp., Micrococci, non-hemolytic Streptococci, and aerobic spore-formers).

Figure 2: "Udder-Thigh Dermatitis": Sloughing of large necrotic patches of skin.



Figure 3: "Udder-Thigh Dermatitis": Beginning reepithelialization.



Etiology and Pathogenesis: Since no indications of the pre-existence of another disease were seen in the vast majority of the patients, it is assumed that the illness occurs independently. WEIGT (1977, 1979, and 1981) suspected that mange mites are of etiologic importance. This is not supported, however, by the findings of these investigations.

On the basis of the results of the bacteriologic investigations, a primary bacterial origin does not come into consideration. *C. pyogenes*, the only bacterial species found which is classified as a primary pathogen, appeared in only 5 of a total of 36 patients from which swabs were taken. The severe purulent inflammation with abscess formation otherwise caused in cattle by this bacterium, was not observed in any of these animals. The pathologic lesions as well as the clinical signs in the 5 animals with *C. pyogenes* were no different than those of the animals with no indication of the presence of *C. pyogenes*. The other bacteria present corresponded to the normal flora of healthy cattle skin or could be regarded as harmless secondary flora. It is noteworthy that *Staphylococcus aureus*, the most frequent agent of inflammatory dermatitis, as well as acne and furunculosis, was not once recovered.

Primary bacterial invasion of the intact skin is improbable. It is assumed more likely that a lesion of the skin precedes a secondary bacterial colonization. Such an injury can easily be explained by the conditions prevailing at the affected site in the peripartum period, because all the requirements for the formation of intertrigo are present: skin surfaces with little or no hair coat are pressed together and undergo friction in a largely closed space ("moist chamber"). When epithelial defects appear, the ubiquitous bacteria can easily invade, especially since the local defense system is likely to be reduced in the area due to the poor perfusion associated with pressure and edema.

TABLE 1. Maximum extent and severity of lesions of 41 cows with "Udder-Thigh Dermatitis."

	One side affected (n = 20)	Both sides affected (n = 21)
Grade I (Superficial lesions, up to pocket-watch size)	12	-
Grade II (Epidermal necrosis, up to hand's width)	8	15
Grade III (Extensive necrosis with inclusion of the subcutis)	-	6

TABLE 2. Comparison of the aerobic bacterial flora from the groins of cows with "Udder-Thigh Dermatitis" and from healthy control animals.

Bacterial species	41 Samples from 36 affected animals					15 Samples from 9 healthy animals				
	Bacteria count				Total	Bacteria count				Total
	+	++	+++	++++		+	++	+++	++++	
Corynebacterium pyogenes	1	2	2	-	= 5	-	-	-	-	= 0
Corynebacteria sp.	9	12	8	3	= 32	1	-	-	6	= 7
Streptococci, non-hemolytic	4	1	-	-	= 5	-	-	-	-	= 0
Streptococci, α -hemolytic	1	-	-	1	= 2	-	-	-	-	= 0
Micrococci	8	1	3	1	= 13	3	2	6	2	= 13
Spore-formers, aerobic	8	-	-	-	= 8	4	-	-	-	= 4
Escherichia coli	4	1	-	-	= 5	-	-	-	-	= 0
Proteus vulgaris	4	2	-	-	= 6	-	-	-	-	= 0
Flavobacteria	-	-	-	-	= 0	1	-	-	-	= 1
Nocardia	2	-	-	-	= 2	7	-	-	-	= 7
Total	41	19	13	5		16	2	6	8	

Bacteria count:

- + = 1-10 colonies per media plate = minimal
- ++ = 10-50 colonies per media plate = moderate
- +++ = light lawn on the media plate = heavy
- ++++ = thick lawn on the media plate = extreme

Numbers in the table = Frequency of isolation.

In view of the deep necroses seen in some cases, the apparently minimal disturbance of the general condition of the animal is noteworthy.

The abatement of udder edema may be of considerable importance to the healing, since an important causative factor is eliminated with decreasing pressure on the contacting skin surfaces, and the resulting improvement of microcirculation favors the repair process.

Diagnosis and Differential Diagnosis: By the time the unpleasant odor of the affected animals is noticed by the owners or the milkers, the lesions are mostly in such an advanced state, that their recognition poses no problems. Other diseases of the skin of the udder are brought into question only as remote possibilities as differential diagnoses. Bovine Herpes-mamillitis (agent: Bovine Herpesvirus Type 2) displays large confluent blisters on the teats and at the teat base, and Stephanofilariasis appears in this country with quite typical lesions exclusively in pasture grazed animals and principally in front of the udder or on the teats. These types of lesions were, however, not seen in any of the cases.

Prognosis: As already mentioned, all of the examined animals recovered completely, even where the process took several months in some cases. The case described by JOHNSTON (1972) with very severe lesions (the udder parenchyma was exposed) also healed "remarkably". A poor

prognosis (WEIGT, 1977) would therefore not seem required. It was actually quite impressive to note how even the apparently hopeless cases improved and finally healed completely.

Therapy: Since the treatment of most of the animals under investigation was the responsibility of the cooperating practitioners, no controlled therapeutic trials were conducted. The type and location of the lesions, however, do advise the following measures: thorough but gentle cleansing (for instance with camomile extract or an acriflavine solution), removal of necrotic tissue, drying and treatment with an astringent and antibacterial local therapeutic agent. Should mange mites be found, proper control measures are indicated. In cases of small areas of necrosis, surgical treatment (excision down to healthy tissue) can shorten the course of the disease (BUFF, 1977; observations by the authors).

Epidemiology and Significance: The disease occurs infrequently and predominantly in heifers after the first calving. Possibly the prevailing udder shape of these animals concentrates pressure laterally on the base of the udder. Markedly increased udder edema and high milk production seem to produce a certain predisposition as well. How great a role a lack of motion plays (all 41 patients were held in tie stalls year-round) - possibly by allowing increased udder edema - could not be evaluated. Animals which developed

the disease at the first calving seemed to be prone to recurrence.

The results obtained explain why no animals with udder-thigh dermatitis were found among the 1800 cows examined at the Munich city slaughterhouse: during the stage of lactation in which the disease appears, cows with a reasonably high milk production would only very exceptionally be sent to normal slaughter (and only normal slaughter animals were examined).

The disease is certainly of no major economic importance, but individual cases can be considerable annoyance to the milker. Treatment is indicated not only on aesthetic, but also on hygienic grounds.

Nomenclature

The only previous publications, found by the authors, which mention this disease use the terms "udder dermatitis" (JOHNSTON, 1972), "intertrigo" (WEIGT, 1977 and 1979), "flexural seborrhoea" (BLOOD et al., 1979) or "necrotic dermatitis" (SIEGMUND, 1979). The expression "udder dermatitis" only partially does justice to the localisation of the disease, since the lesions affect the medial surface of the thigh routinely and to an equal extent. The term "intertrigo" is appropriate, from our point of view, considering the

suspected pathogenesis, but contains no topographical reference. "Flexural seborrhoea" clearly is an euphemistic misnomer for a disease process that produces deep necroses. "Necrotic dermatitis" also contains no topographical reference; strictly speaking it applies only to a certain grade and stage of the disease. Therefore we suggest the name "udder-thigh dermatitis", whereby the addition of the numbers I to III could indicate the corresponding severity, thus

- Grade I: superficial lesions, up to pocket-watch size;
- Grade II: epidermal necrosis up to hand's width;
- Grade III: extensive necrosis with inclusion of the subcutis.

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