



Prevalence of hoof diseases in cows

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Abstract. An increasing incidence of orthopaedic disorders, including the development of purulent conditions, has been recorded among cows on dairy farms. These disorders are typically accompanied by localised inflammatory reactions, which adversely affect the overall physiological state of the animals, leading not only to reduced milk yield but also to premature culling. This study aimed to determine the prevalence of orthopaedic disorders in dairy cows, identify their forms and clinical characteristics, and develop approaches to local treatment. Monitoring studies were conducted at livestock farms in the Vinnytsia, Donetsk, Lviv, and Cherkasy regions. Data were obtained on the prevalence of orthopaedic pathology in dairy cows, including the identification of nosological forms, degrees of lameness, and the effectiveness of treatment applied. Lameness was assessed by observing cows in motion. The final diagnosis of the pathological condition was made following an examination of the distal limb segments and orthopaedic hoof trimming. As a result of the examination, aseptic pododermatitis was diagnosed in 7.5%-48.0% of cows within the observed herds; clinical signs of purulent infiltration at the base of the sole's dermis in the pedal segment of the hindlimbs were identified in 5.6%-18.0% of cows; and over 50.0% of cows were found to have papillomatous digital dermatitis over the past two years. By the sixteenth day following the course of treatment, two-thirds of the affected animals had recovered. Subsequent clinical evaluations of cows before and after local therapy revealed no signs of progression of

Suggested Citation:

Klymas, A., & Syrlyk, M. (2024). Prevalence of hoof diseases in cows. *Ukrainian Journal of Veterinary Sciences*, 16(1), 88-103. doi: 10.31548/veterinary1.2025.88.

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purulent processes in the distal limb region. These findings indicate the positive effect of local treatment using Intra Hoof-fit Gel (Netherlands), the wound-healing Intra Repiderma Spray (Netherlands), and Intra Hoof-fit Tape (Netherlands) by day sixteen, resulting in treatment efficacy rates of 90.0%-93.3%. The results obtained are of practical value for both researchers and practising veterinary professionals and may contribute to the improvement of treatment protocols for orthopaedic disorders in dairy cows

Keywords: surgical pathology; animal welfare; orthopaedics; lameness; local therapy

Introduction

Hoof diseases and the resulting lameness in cows are a widespread problem of increasing importance in maintaining animal health. Preventative hoof trimming is a crucial procedure for promoting cow health. Specifically, it is considered optimal to perform orthopaedic hoof trimming at least twice a year to maintain hooves in a physiologically functional state. Regular hoof trimming prevents deformation of the horn capsule. Damage to the horn layer disrupts limb posture, leading to overstretching of tendons and the development of aseptic, and subsequently purulent, processes in the dermal base area.

R. Laven *et al.* (2024) expanded the understanding of the aetiology and pathogenesis of orthopaedic conditions in their research. They reported data showing that aseptic pododermatitis is accompanied by haemorrhages in the sole and white line. These haemorrhages are considered precursors to purulent pododermatitis and specific sole ulcers. The researchers concluded that understanding the development of haemorrhage in the sole horn is vital for determining the aetiology and pathogenesis of orthopaedic conditions and for assessing stress factors affecting the hoof. Their findings contribute to the development of evidence-based prevention and treatment plans for these animals.

Scientists D. Kucevic *et al.* (2022) studied 6,348 Holstein dairy cows from 5 farms to

investigate the impact of housing systems (tie-stall vs. free-stall barns) on the prevalence of hoof diseases and culling rates. The researchers collected data on the causes of lameness, established diagnoses, and provided treatment. The animals underwent functional-corrective hoof trimming. Over the three-month study period, the average culling rate for cows in free-stall housing was 5.4%, compared to 4.9% in tie-stall housing. This difference was not statistically significant.

In their research, American scientists T.S. Marshall *et al.* (2024) in Missouri studied 34 cows with orthopaedic conditions for 4 weeks. They demonstrated that a hoof bath solution containing stannous fluoride (SnF₂) was superior to a 5% copper sulphate solution for the treatment and prevention of digital dermatitis (DD) in dairy cattle. Their results showed that passing cows through the stannous fluoride bath once a week in a herd experiencing active infection transmission was more effective in preventing new lesions, but less effective in treating existing digital dermatitis lesions, compared to passing cows through a copper sulphate bath four times a week.

Purulent pododermatitis in cattle develops from aseptic pododermatitis when hooves become deformed with signs of horn sole breakdown. This was noted in an article by N.M. Khomyn *et al.* (2024). According to their data, the disease is partly caused by delayed

corrective trimming, hoof deformation, and poor housing conditions due to prolonged confinement (winter housing period). Their research showed that mechanical factors are the primary cause of local purulent processes in the dermal layer in the sole segment. When purulent inflammation develops, limb posture and weight distribution on the hoof sole are disrupted. In many cases, animals shift weight onto the healthy digit. Inflammatory exudate infiltrates the dermal tissues, initiating a local pathological process in the sole area, which may become purulent if microorganisms enter the affected site. Another cause of purulent pododermatitis is a puncture of the sole, followed by an infection of the injured area with pathogenic microorganisms, which mainly occurs during the pasture period.

According to research by L. Langova *et al.* (2020), lameness, which often results from hoof lesions, poses serious animal welfare problems on dairy farms. Hoof trimming is one method to prevent these lesions, but the overall effect and optimal trimming frequency are not fully understood. In a retrospective study, K. Grimm *et al.* (2024) analysed the relationship between hoof trimming frequency in first-lactation cows, their functional status, and culling during their second lactation. The authors concluded that reducing hoof lesions through trimming significantly improved animal welfare, productivity, and longevity.

As noted by Y. Saito *et al.* (2024), lameness is a symptom of distal limb lesions. The authors, based on their research, found that the disease, caused by hoof lesions, affected animal welfare and reduced dairy cow productivity. Furthermore, they reported that the prevalence of various types of hoof lesions varied depending on environmental conditions and the animal housing system on the dairy farm.

A. Dias *et al.* (2024) investigated the impact of hoof pain and lesion severity on

animal mobility. The authors demonstrated that localised pain causes visible changes in cow movement. Animals spent longer periods lying down in stalls and were reluctant to stand. The authors found that sole ulcers increased movement activity, while digital dermatitis and sole haemorrhage, conversely, decreased animal mobility. In a static position, changes in hoof support and position were observed. Specifically, weight was shifted to the healthy limb, heel support was used, and weight distribution was uneven during stepping. The researchers suggested that changes in behavioural indicators related to support, weight distribution, and limb position help identify cows with hind-limb hoof lesions. Therefore, regular observation by farm staff could help identify lame cows requiring treatment.

M.I. Rodríguez *et al.* (2021) assessed the relationship between hoof pathologies and milk production in dairy farms in the Caaguazú Department of Paraguay. They examined 50 cows diagnosed with hoof pathologies during the declining phase of lactation. The researchers found that white line disease had the least impact on milk production.

Lameness is one of the most significant and economically damaging problems in cattle farming. M. Bayer *et al.* (2023) found that changes in movement activity are most often associated with limb lesions, particularly in the hind limbs. The authors noted that pain reactions in cows lead to depression and reduced milk production. Other factors contributing to limb dysfunction include feeding imbalances, poor hygiene, management errors, genetic predisposition, and breeding issues. A well-balanced diet, rich in macro- and micronutrients and amino acids involved in keratinisation, is essential for healthy hoof horn formation, preventing many orthopaedic lesions in cows. Proper keratinisation creates a resilient hoof horn that is impermeable and resistant to

external factors like injuries and the effects of bacterial and fungal keratinases, which break down disulphide bonds in the hoof horn.

P.T. Thomsen *et al.* (2020) found that cows undergoing hoof trimming late in pregnancy have a higher risk of abortion. The researchers determined that the probability of pregnancy termination is lower in Jersey cows and higher in cows pregnant with twins. The likelihood of pregnancy termination is also 2.4 times higher in cows that had their hooves trimmed within the last four weeks of gestation.

Y.-J. Chiu & J.-T. Hsu (2022) evaluated and demonstrated a link between behaviour and hoof lesions in lactating Jersey dairy cows. Specifically, they assessed body condition using an automated activity monitor (AfiTag II, AfiMilk, Afikim, Israel) attached to the right hind limb. The authors concluded that cows developing hoof lesions (80.0% with sole haemorrhages) had shorter lying durations (daily and in the early postpartum period). Therefore, they concluded that a reduced daily lying duration should be considered a risk factor for hoof diseases in lactating dairy cows.

H. Pirkkalainen *et al.* (2022a) found that hoof pathologies lead to lameness and animal welfare problems. This results in an increase in acute-phase proteins in the blood serum, which are markers of the inflammatory phase response. Specifically, the authors noted an elevation in serum amyloid A, haptoglobin, and interleukin-6 concentrations. The study evaluated the inflammatory response of cows with sole ulcers, pododermatitis, and digital dermatitis compared to healthy cows. It was demonstrated that serum amyloid A concentrations were significantly higher in cows with sole ulcers compared to the control group (cows without hoof lesions) over a two-week study period. These results indicate that sole ulcers initiate a prolonged systemic inflammatory response in dairy cows.

Therefore, this study aimed to determine the prevalence of orthopaedic conditions in cows on several dairy farms and to assess the effectiveness of local treatment using Intra Hoof-fit Gel, the wound-healing Intra Repiderma Spray, and Intra Hoof-fit Tape. Achieving this goal is important for improving the prevention and treatment of orthopaedic conditions in cows, which will reduce morbidity and enhance animal productivity. Furthermore, confirming the effectiveness of these topical treatments will optimise veterinary practices and improve the economic efficiency of dairy farming.

Materials and Methods

The research was conducted from December 2023 to November 2024 at dairy farms including: ALLC "Ridnyi Kray" (Yampil district, Vinnytsia region); LLC "Svitanok" (Pokrovsk district, Donetsk region); ALLC "Bilyi Stik" (Sokal district, Lviv region); and LLC "YuM-Vatutino" (Zvenyhorod district, Cherkasy region). Specific aspects of the research were carried out at the scientific laboratories of the Faculty of Veterinary Medicine, Poltava State Agrarian University (Poltava). All animals underwent clinical examination and clinical-instrumental assessment.

During the clinical examination of the cows, attention was paid to their body position: standing or lying. The position of the affected limb was noted, including whether the hoof was bearing weight (full weight bearing, lifting the limb off the ground, or only partial weight bearing on the heel or toe). The condition of the soft tissues surrounding the horn capsule was examined visually and by palpation. Palpation was also used to assess the presence or absence of increased pulse amplitude in the digital arteries. Hoof testers were used to examine the condition of the sole (pain upon pressure and flexibility of the sole horn).

Animal experiments were conducted following Order of the Ministry of Economic

Development, Trade and Agriculture of Ukraine No. 224 (2021) and in compliance with the international principles of the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (European Convention on..., 1986), and the Law of Ukraine No. 3447-IV "On the Protection of Animals from Cruel Treatment" (2006).

A total of 1,380 cows underwent an orthopaedic examination. Hoof-trimming procedures also included monitoring for limb diseases in cows. Digital colour photographs from literature sources (Espinasse, 1984) were used to identify each hoof lesion, according to the international classification system adopted at the 15th International Conference on Lameness in Ruminants held in Finland (International Veterinary Information Service, 2008).

The stages of hoof trimming involved mandatory restraint of the cow in a standing position within an orthopaedic crush. Hoof trimming included limb fixation in a comfortable position, removal of debris and loose old sole horn from the horn capsule surface using a hoof knife until elastic tissue was exposed, levelling of the hoof wall with nippers, and final smoothing with an angle grinder fitted with an orthopaedic milling cutter. Finally, a visual assessment of the hoof and limb position was performed on a level surface.

Hoof lesions were diagnosed during trimming based on visual examination, the presence of a specific odour in the pathological focus, and localised pain reactions in the cows, according to the international standardised diagnosis described by J. Espinasse (1984). Lesions were recorded as absent or present on the hind hooves. To determine the effectiveness of local treatment for digital dermatitis, 30 affected cows from each farm were selected using an analogue-based approach.

Based on the visual examination data,

the following diagnoses were established and recorded: aseptic and purulent pododermatitis and digital dermatitis. After trimming and initial surgical debridement of the lesions, the affected cows were treated topically twice, with a five-day interval, using the antibiotic-free hoof gel Intra Hoof-fit gel (Intracare, Netherlands). The hoof was thoroughly cleaned before gel application. Subsequently, disposable wipes were used to remove purulent exudate and devitalised tissue thoroughly. After examination and confirmation of the absence of purulent exudate in the sole region and interdigital space, the surface was dried, and the topical medication was applied according to the instructions. Intra Hoof-fit Gel was applied in a thin layer to the affected surface using a brush. Per the study objectives, the topical medication was applied once every five days, and its therapeutic effect was subsequently evaluated. If necessary, the wound-healing Intra Repiderma Spray (Netherlands) was used. Before use, the canister was shaken. The spray was applied to the skin surface for 3 seconds from a distance of 15-20 cm to ensure even coverage. The product was allowed to dry for at least 30 seconds before applying an Intra Hoof-fit Tape (Netherlands). After the experiments were completed, the data was statistically analysed using Statistica 5.0 software (StatSoft Inc., USA), and the results were presented as mean (M) values in tables.

Results and Discussion

To understand the prevalence of orthopaedic conditions among dairy cows, a clinical examination of the animals present on the farms was conducted. The study involved visual inspection of the cows and, where necessary, local examination. The latter allowed the identification of cows with hoof pathologies, forming the experimental group (Table 1).

Analysing the results on the structure of

Table 1. Structure of digital region pathology in dairy cows

Clinical forms	Affected limbs																		
	Right forelimb			Left forelimb			Both forelimbs			Left hindlimb			Right hindlimb			Both hindlimb			
	Hooves																		
	L	M	B	L	M	B	L	M	B	L	M	B	L	M	B	L	M	B	
AP	Ridnyi Kray ALLC (250 cows), Vinnytsia region																		
	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-	84
	Svitanok LLC (350 cows), Donetsk region																		
	-	-	-	-	-	-	-	-	-	70	-	-	-	-	-	-	-	-	98
PP	Bilyi Stik ALLC (600 cows), Lviv region																		
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45
	Ridnyi Kray ALLC (250 cows), Vinnytsia region																		
	-	-	-	-	-	-	-	-	-	9	4	5	1	4	8	-	-	-	14
MD	Svitanok LLC (350 cows), Donetsk region																		
	-	-	-	-	-	-	-	-	-	4	2	2	4	2	6	-	-	-	28
	Bilyi Stik ALLC (600 cows), Lviv region																		
	-	-	-	-	-	-	-	-	-	5	10	10	10	5	15	-	-	-	35
MD	Ridnyi Kray ALLC (250 cows), Vinnytsia region																		
	-	-	-	-	-	-	2	11	12	7	4	10	8	6	7	-	-	-	133
	Svitanok LLC (350 cows), Donetsk region																		
	-	-	-	-	-	-	-	-	65	-	-	13	-	-	24	-	-	-	263
	Bilyi Stik ALLC (600 cows), Lviv region																		
	-	-	-	-	-	-	-	-	45	-	-	-	-	-	-	-	-	-	235
MD	YuM-Vatutino LLC (180 cows), Cherkasy region																		
	-	-	-	-	-	-	-	-	78	-	-	-	-	-	-	-	-	-	88

Note: AP – aseptic pododermatitis; PP – purulent pododermatitis; MD – Mortellaro’s disease; L – lateral hoof; M – medial hoof; B – both

Source: authors’ development

orthopaedic pathology, it was found that during orthopaedic hoof trimming of 250 cows at ALLC "Ridnyi Kray", 40.4% showed aseptic pododermatitis (Fig. 1). In 84.0% of these cases, the disease was found on the hind limbs as oily yellow or bluish spots on the sole region. These animals spent long periods lying down and were reluctant to stand when attempts were made to move them. In a standing position, the affected animals shifted their body weight to the healthy limb. Palpation of these animals revealed an increased pulse amplitude in the digital arteries (a specific throbbing sensation upon palpation of the digital flexor tendons). When pressure was applied to the sole using hoof testers, localised pain and attempts by the animal to

free the limb from restraint were noted.

The aforementioned is supported by re-



Figure 1. Aseptic digital pododermatitis of hind limbs

Note: arrows indicate areas of sole horn infiltration with exudate

Source: authors’ photo

search from N.M. Khomyn *et al.* (2024). Specifically, the researchers found that cows with aseptic pododermatitis were reluctant to rise, often with groaning. At rest, they frequently shifted weight from limb to limb. Some animals exhibited a degree of postural tension during prolonged standing. Cows stood hunched, bringing their hind limbs under their body or pushing them back, carefully bearing weight on the hooves that showed deformation. This undoubtedly disrupted the even distribution of load on the sole area during weight bearing, leading to the formation of distorted hooves. The authors noted that deformation altered the sole region's topography, and weight-bearing occurred on only a small portion of the area, while the larger part of the sole did not touch the ground. This

disrupted the even distribution of body weight on the sole area, resulting in the overloading of some parts and the unloading of others. Excessive overloading of certain sole parts over time led to profound functional changes and the development of chronic aseptic pododermatitis. The researchers believed that the locomotor characteristics of the hind limbs and the relatively small toe angle of their hooves predispose them to deformation and the development of aseptic pododermatitis.

In 14 cows (5.6%) from the same farm, purulent pododermatitis of the hind limbs was also diagnosed (Fig. 2). The latter was predominantly located on the lateral digits of the hind limbs in the heel region. These were primarily superficial purulent lesions.

Clinically, the manifestation of purulent

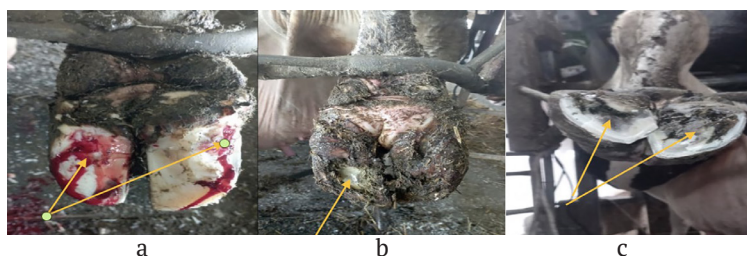


Figure 2. Purulent pododermatitis of hind limbs in cows

Note: a) areas of necrotic tissue on the dermal base in the sole segment; b) focus of purulent exudate; c) areas of damaged sole horn

Source: authors' photo

lesions on the dermal base in the sole segment was accompanied by the animal's desire to lie down for extended periods and reluctance to stand. The animals did not bear weight on the affected hoof, keeping them suspended. Affected cows periodically only touched the ground with the toe region, resulting in characteristic sole wear. Pain was observed upon the application of pressure to the affected area with hoof testers or even fingers, and polymorphonuclear purulent exudate was released when a funnel-shaped opening was

cut into the sole region.

Approximately half of the animals examined over the two-year study period showed signs of Mortellaro's disease to varying degrees: redness of the skin in the coronary band and interdigital tissues and signs of tissue damage in the heel (Fig. 3). Palpation of the pathological areas on the affected limbs revealed significant pain. Minor accumulations of purulent exudate were observed on the surface of local lesions associated with this condition.

X. Ma *et al.* (2024) demonstrated that dig-

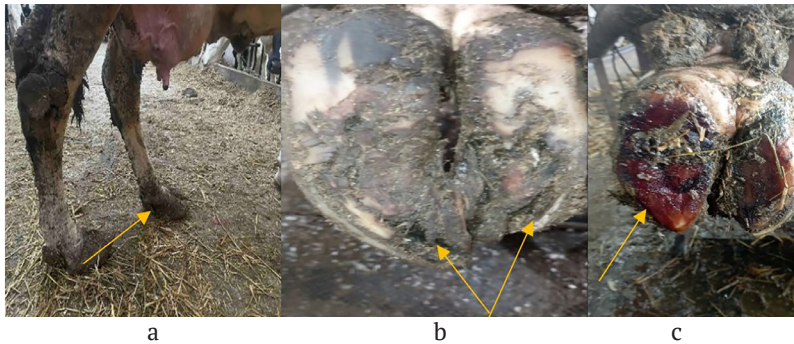


Figure 3. Animals affected by papillomatous digital dermatitis

Note: a) abnormal limb posture, heel weight bearing; b) horn separation in the sole region; c) areas of damaged sole horn
Source: authors' photo

ital dermatitis is a major cause of lameness in dairy cattle, particularly in animals housed in stalls for extended periods. The authors investigated the prevalence of digital dermatitis on three farms in Jiangsu, China. The disease was found on all three farms. All lesions were chronic. The prevalence of the disease in cows on the farms ranged from 7.3% to 10.8%.

Research on the prevalence of orthopaedic conditions in animals at LLC "Svitanok" (350 cows) revealed that the highest percentage of lesions in the existing herd was aseptic pododermatitis – 48.0%, which was more frequently diagnosed in the hind limbs (Table 1). This was primarily due to irregular hoof trimming in the animals and the formation of deformities. In 18.0% of the animals, signs of purulent pododermatitis were diagnosed on the hind hooves. This type of pathology developed as a result of microorganisms entering the dermal layer of the sole through damaged areas of the sole. In 75.0% of cases, cows were diagnosed with digital dermatitis over two years, with varying degrees of clinical symptom intensity. The research found significantly fewer cases of aseptic pododermatitis in cows at ALLC "Bilyi Stik", namely 7.5% of the existing herd. The proportion of purulent pododermatitis was 13.0%, and digital dermatitis was diagnosed in nearly half

of the cows at various times during the study. At LLC "YuM-Vatutino" (180 cows), the majority of cows showed signs of digital dermatitis.

The data obtained largely aligns with the results of P. Patoliya *et al.* (2024). Specifically, the authors noted that the problem associated with orthopaedic pathology has become particularly acute due to the transition of animal husbandry to an industrial basis and the concentration of a large number of animals in limited areas. This problem has been especially exacerbated in the context of dairy farming specialisation, which is associated with a sharp change in animal feeding and housing. Hoof diseases in cows are common and cause significant losses to farms (Aliiev & Gavrilenko, 2018). Farms suffered colossal losses in milk production due to reduced milk yield from cows with hoof lesions. When an animal was lame, production losses ranged from 20% to 50% or more. Simultaneously, lameness in cows negatively affected the reproduction process: a shortfall of up to 17 calves per 100 cows was observed, and the most productive cows had to be culled, leading to forced frequent herd rotation.

As noted by A.R. Mysak *et al.* (2020), 70%-80% of all animal diseases are non-contagious, with more than 50% of these being surgical, causing significant economic losses

to the livestock industry due to reduced productivity and premature culling of animals. Irrational, unbalanced feeding in terms of macro- and micronutrients, vitamins, and carbohydrates leads to metabolic disorders. This has resulted in researchers recording profound destructive degenerative changes in bones, joints, ligaments, and tendons, as well as impaired horn formation in hooves.

The data obtained is also confirmed by the results of other researchers. Specifically, R.C. Ebling *et al.* (2019) demonstrated that hoof lesions are a major cause of reduced productivity in the dairy industry and are caused by changes in cow movement activity and the frequency of hoof trimming. This is also supported by data from N.M. Khomyň *et al.* (2024). The most significant conclusion of this study was that to prevent the widespread occurrence of hoof diseases in cows, regular trimming of the horn capsule and the provision of a complete diet and regular exercise are necessary. Adherence to these principles will enable veterinarians to prevent the spread of hoof diseases in cows, including the development of inflammatory processes in the dermal base of the sole.

Following the identification of the main pathological forms, the efficacy of the topical application of Intra Hoof-fit Gel was determined. The rationale for choosing this particular treatment lies in the fact that Hoof-fit Gel contains copper, which is a component of the cytochrome oxidase enzyme, thereby supporting keratinisation processes, particularly the formation of disulphide bonds. Zinc, in conjunction with copper, exhibits antiseptic properties and is

capable of neutralising a significant number of microorganisms present in the lesion. The chelated form of these elements enhances these properties. The soluble state of these elements ensures high, stable antiseptic properties. This is achieved through an increased number of active sites of copper and zinc. In their chelated form, the elements of the preparation act not only on the surface but also penetrate deep into the affected tissues, exerting a detrimental effect on microorganisms while simultaneously supporting keratinisation processes. Additionally, isopropyl alcohol, as an auxiliary component, enhances the antibacterial effect of the gel.

The chelated zinc in the gel promoted wound healing: the wound healed quickly. No antibiotic spray has such a wound-healing effect. The gel healed the hoof horn and surrounding tissue, thereby reducing the risk of new bacterial infections. Finally, the gel contains a powerful adhesive that prolongs the contact of the product with the infection on the hoof surface. The gel continues to work even when animals walk through slurry after treatment. Additionally, wound-healing Intra Repiderma Spray was used when necessary. This is a modern, antibiotic-free product with a more effective formula compared to purple iodine sprays and blue chlortetracycline sprays. Limb isolation and fixation of the medication were achieved using Intra Hoof-fit Tape. This is a green, elastic, polyester-based tape for external use on animals, with fabric and latex coating for better fixation when bandaging cattle hooves. The research results are presented in Table 2.

Analysis of the data revealed that for pu-

Table 2. Treatment efficacy for purulent pododermatitis and digital dermatitis in experimental farms

Livestock farm	Total animal, heads	Cows					
		Healed by day 12		Healed by day 16		Healed by day 24	
		heads	%	heads	%	heads	%
Purulent pododermatitis							
ALLC Ridnyi Kray	45	36	80.0	38	84.4	42	93.3
LLC Svitanok	48	33	68.7	41	93.3	48	100.0

Table 2. Continued

Livestock farm	Total animal, heads	Cows					
		Healed by day 12		Healed by day 16		Healed by day 24	
		heads	%	heads	%	heads	%
Purulent pododermatitis							
ALLC Bilyi Stik	90	76	84.4	83	92.2	88	97.7
Digital dermatitis							
ALLC Ridnyi Kray	30	25	83.3	28	93.3	28	93.3
LLC Svitanok	30	26	86.6	28	93.3	30	100.0
ALLC Bilyi Stik	30	24	80.0	27	90.0	30	100.0
LLC YuM-Vatutino	30	27	90.0	28	93.3	30	100.0

Source: authors' development

ulent pododermatitis, by the 12th day of the study, over two-thirds of the total number of affected cows in all experimental farms had clinically recovered. The subsequent trend was also positive. The results demonstrated the high effectiveness of the chosen treatment method using the topical medication. Comparing the results from the 16th day of the study with those from the 12th day, it was found that at ALLC "Ridnyi Kray", an additional 2 animals (5.3%) recovered; at LLC "Svitanok", an additional 8 cows (19.6%) recovered; and at ALLC "Bilyi Stik", the number of affected animals decreased by 7 heads (8.5%).

During the examination on the 24th day of the experiment at ALLC "Ridnyi Kray", it was found that the proposed topical treatment resulted in the recovery of 9 out of 10 cows. Only three cows showed incomplete recovery with partial improvement. The high effectiveness of the proposed topical treatment was also observed in cows at ALLC "Bilyi Stik", where only two animals remained affected by the end of the study period. An even higher effectiveness was observed in cows at LLC "Svitanok". At the time of examination, no affected animals were found. The final number of recovered cows, compared to the 16th-day data, showed an increase: at ALLC "Ridnyi Kray", an increase of 4 heads (9.6%); at LLC "Svitanok", an increase of 7 heads (14.6%); and ALLC "Bilyi Stik", an in-

crease of 5 heads (5.7%).

When treating digital dermatitis with the proposed method, the percentage of recovered animals by the 12th day of the study in the experimental farms ranged from 83.3% to 90.0% compared to the baseline data. The high efficacy of the drug components was evident in the local disappearance of signs of inflammation. The highest number of recovered cows was observed at LLC "YuM-Vatutino" (27 heads), and the lowest at ALLC "Bilyi Stik" (83.3%). Analysing the data obtained on the 16th day of observation, the percentage of recovered animals increased to 90.0-93.3%. Accordingly, the number of affected animals during this study period decreased by three (10.8%) at ALLC "Bilyi Stik", by two heads (7.2%) at LLC "Svitanok", and by one animal (3.6%) at LLC "YuM-Vatutino" compared to the 12th-day data.

The final observation results on the 24th day demonstrated the high efficacy of the topical treatment applied to animals suffering from digital dermatitis. In three out of four farms, no affected animals were found. Only at ALLC "Bilyi Stik" did the percentage of recovered cows remain at 93.3%. Compared to the previous 16th-day data, the number of affected cows decreased by two animals at ALLC "Bilyi Stik", LLC Svitanok, and LLC "YuM-Vatutino" (6.7%) and by three heads at ALLC "Bilyi Stik" (10.0%). Thus, it was established that hoof trimming twice a year

reduces the number of lame cows. Furthermore, Intra Hoof-fit Gel (Netherlands), wound-healing Intra Repiderma Spray (Netherlands), and Intra Hoof-fit Tape (Netherlands) showed high effectiveness in treating these animals. The proposed method resulted in the clinical recovery of the majority of animals by the 24th day.

The obtained results align with those of other researchers. For example, M. Ninkovic *et al.* (2021) found that pododermatitis and sole ulcers are widespread hoof diseases on small, non-commercial farms in Serbia. The authors noted that regular hoof trimming is crucial for the proper functioning of cow hooves. Their research demonstrated that regular hoof trimming (twice a year) and adequate housing conditions are essential for improving hoof health.

S.Praveen *et al.* (2024) pointed out that hoof lesions in dairy cows are typically treated with trimming. However, trimming itself can cause severe pain or exacerbate existing pain. The authors recommended using Tri-Solfen (Bayer Animal Health, Pymble, Australia) – a spray gel containing lidocaine, bupivacaine, and cetrimide – for topical treatment after trimming. Their research showed that the product effectively alleviated pain during and after hoof trimming. The present study yielded similar data, specifically, that timely hoof trimming (twice a year) prevents the occurrence of pathological conditions and that topical application of Intra Hoof-fit Gel, wound-healing Intra Repiderma Spray, and Intra Hoof-fit Tape resulted in the recovery of the majority of cows by the 16th day.

The obtained data is entirely consistent with research conducted by M. Waldbauer *et al.* (2024). The researchers found that hoof diseases, and consequent lameness in these animals, are quite common in cows. The authors noted that the economic losses due to hoof diseases in cows include increased costs for staff and animal treatment, and decreased productivity and fertility. As in the described

studies, the researchers consider regular hoof trimming to be the main treatment strategy. The latter involves hoof trimming of the entire animal population at 6-month intervals.

M.B. Sadiq *et al.* (2021) described the prevalence of hoof lesions, their association with lameness, and related risk factors in dairy cows in Peninsular Malaysia. Data on hoof lesions were recorded after examining the distal limbs of 1,051 cows from 29 dairy farms. A total of 903 hoof lesions were recorded in 486 cows (46.2%). The highest percentage of lesions was recorded in the hind limbs (73.4%), and 51% of cows had more than one lesion. Non-infectious lesions predominated aetiologically (79.0%). In the present study, 40.4% of the examined animals were diagnosed with aseptic pododermatitis. Thus, the prevalence of pathology in the described studies was one-third lower.

According to H. Pirkkalainen *et al.* (2022b), digital dermatitis is the most common hoof disease in cattle in Europe. Copper sulphate and formalin are commonly used in hoof baths, but their use is problematic in many European countries due to health, environmental, and safety concerns. The authors noted that, based on their observations, the most effective method for treating animals is the use of hoof baths with acidified copper sulphate. This bath consisted of copper sulphate (2%) mixed with an organic acid for acidification and subsequent ionisation of the solution. Treatment of affected cows involved passing them through the acidified copper sulphate solution twice a day upon exiting the milking parlour. The proposed treatment method is one of the best and most widespread ways to combat digital dermatitis.

E. El-Shafaey *et al.* (2021) confirm the data obtained in this study. Specifically, the authors noted that the regular use of hoof care and cleaning products is an important element in preventing the development of hoof diseases, particularly digital dermatitis. Furthermore, the

effectiveness of topical application of a mixture of complex iron salts, zinc salts, and aluminium salts to affected animal hooves was established. The affected hoof areas underwent hygienic procedures and were sprayed with the preparation twice a week. Their research showed an almost six-fold higher treatment efficacy compared to the control group, which received topical copper sulphate. According to Serbian researchers M. Ninkovic *et al.* (2021), the health of cow hooves is directly related to regular trimming. Performing hoof trimming twice a year and providing adequate housing conditions are crucial for improving the health of the distal limbs. Aseptic and purulent pododermatitis, as well as sole ulcers, are among the most common hoof pathologies on small, noncommercial farms in Serbia. It is also well-known that a range of aseptic and purulent processes in the hoof region can be identified during preventative trimming. For instance, researchers examined 108 Simmental cows from 14 farms between March and October 2020 and diagnosed hoof diseases in 23.1% of the animals.

Therefore, scientific research aligns with the results of the current study regarding the importance of preventative hoof trimming to prevent the development of inflammatory diseases in the distal limbs of cows. Various methods proposed for treating cows with such diseases and used in modern veterinary medicine demonstrate their effectiveness. The use of the therapeutic agents proposed in the current study facilitated faster recovery in the majority of animals suffering from hoof pathologies.

Conclusions

This article presents the results of a study on the prevalence of various orthopaedic pathologies (aseptic and purulent pododermatitis, papillomatous digital dermatitis) in dairy cows. The study found that 7.5%-48.0% of the cows examined were diagnosed with aseptic pododer-

matitis, 5.6%-18.0% showed signs of purulent infiltration at the dermal base of the sole in the sole segment of the hind hooves, and more than half of the cows on the dairy farms had papillomatous digital dermatitis. Clinical assessment of the experimental animals revealed decreased motor activity, prolonged lying in stalls, moderate lameness during movement, and lifting of the affected limb off the ground when standing. Various forms of hoof pathology in the distal limbs showed localised pain in the affected area, signs of sole horn infiltration (in aseptic lesions at the dental base of the sole), swelling and detachment (in purulent infiltration at the dental base of the sole), and purulent lesions of soft tissues (in papillomatous digital dermatitis). Palpation of the affected animals' distal limbs revealed increased pulse amplitude in the digital arteries.

The topical application of Intra Hoof-fit Gel (Netherlands), wound-healing Intra Repiderma Spray (Netherlands), and Intra Hoof-fit Tape (Netherlands) demonstrated high treatment efficacy in affected animals by the 24th day. In three out of four farms, no cows with hoof pathologies were found. Only at Bilyi Stik ALLC (Lviv Region, Ukraine) did the percentage of recovered cows remain at 93.3%. Thus, a thorough analysis of cow treatment for various forms of distal hind limb pathologies, using topical medications fixed to the sole surface of the hoof after orthopaedic sole trimming, demonstrated the high effectiveness of the presented therapy method, which is supported by clinical research data.

Future research plans include testing other topical medications for the treatment of cows with orthopaedic conditions. The treatment protocol will involve similar orthopaedic hoof trimming and the application of the topical medication to the pathological defect. Specifically, the effectiveness of applying a powder containing copper sulphate, zinc oxide, iodoform, and potassium permanganate to the pathologi-

cal defect surface will be determined.

The study received no funding.

Acknowledgements

None.

Conflict of Interest

None.

Funding

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Поширення хвороб ратиць у корів

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Анотація. В умовах молочнотоварних ферм у корів реєструється зростання випадків ортопедичної патології, в тому числі з розвитком гнійних процесів. Такі процеси спостерігаються на тлі прояву локальної запальної реакції, яка негативно впливає на функціональний стан всього організму корів, призводячи не лише до зниження молочної продуктивності, а й до передчасного вибракування тварин. Мета роботи полягала у визначенні розповсюдження у молочних корів ортопедичної патології, встановленні її форм, особливостей клінічного перебігу та в опрацюванні методів локальної терапії. Проведено моніторингові дослідження на базі тваринницьких господарств Вінницької, Донецької, Львівської та Черкаської областей. Отримано дані щодо поширення ортопедичної патології у молочних корів, визначено її нозологічні форми, встановлено ступінь кульгавості та ефективність проведеного лікування хворих тварин. Для виявлення кульгавості оглядали корів під час руху. Заключне визначення форми патології здійснювали після огляду в корів дистального відділу кінцівок та за проведення ортопедичної розчистки ратиць. У результаті здійснення огляду в 7,5–48,0 % корів від наявного поголів'я діагностували асептичний пододерматит; у 5,6–18,0 % корів – клінічні ознаки гнійного просочення основи шкіри підошви в сегменті підошви на ратицях тазових кінцівок; у більше ніж 50,0 % корів –

папіломатозний пальцевий дерматит впродовж останніх двох років. Вже на 16 добу після проведеного курсу лікування дві третини хворих тварин одужували. Результати подальшого клінічного обстеження корів до і після проведеного курсу локальної терапії вказували на відсутність ознак прогресування розвитку гнійних процесів у дистальній ділянці кінцівки. Це свідчить про позитивний вплив локального застосування гелю для копит Intra Hoof-fit gel (Нідерланди), ранозагоювального спрею Intra Repiderma (Нідерланди) та бинту Intra Hoof-fit (Нідерланди) на 16 добу, що забезпечило ефективність лікування тварин на рівні 90,0–93,3 %. Отримані результати мають прикладне значення як для науковців, так і для практикуючих ветеринарних лікарів, що сприятиме удосконаленню протоколу лікування корів за ортопедичної патології

Ключові слова: хірургічна патологія; добробут тварин; ортопедія; кульгавість; локальна терапія