

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Etiology, Diagnostics, Preventive Measures and Treatment of Claws in Dairy Cattle Breeding.

Haris N Makaev, Damir A Huzin*, Andrey I Nikitin, Albert N Chernov, and Guliya R Lukina.

Federal Center for Toxicological, Radiation and Biological Safety, Scientific Town-2, Kazan city, 420075, Russia

ABSTRACT

Examination of cattle in 415 agricultural enterprises and examination of 218 samples of pathological and biological material of animals with signs of out limb affection confirmed that in modern mega complexes for the production of milk and meat incidence of necrobacillosis, diseases of digits and claws of non-infectious etiology reaches 52 - 76%. 26 - 52% of cows, 37.8 - 42% of heifers and 65% of feeder bulls have diseases of digits and claws (BOD). Cattle of Holstein breed are more susceptible to BOD. 18-30% of the milking herd is annually weeded out due to these diseases. During research various claws affections of non-infectious etiology were registered: sword-cut and contused wounds, laminitis, pod dermatitis, limax, white line disease, Rusterholz Ulcer, etc. They were infected with pathogenic pyogenic micro flora and the causative agent of necrobacillosis. It is better to perform diagnosis on the basis of clinical and epizoo to logical examination of livestock along with bacteriological examination of biomaterial of sick animals and bioassay on white mice and rabbits. Use of surgical debridement along with local and intramuscular injection of antibacterial and immune stimulating medical drugs and veterinary and sanitary measures is most effective in treatment of BOD of various etiologies. It is advisable to prevent necrobacillosis with the help of vaccines and immune stimulants.

Keywords: diseases of digits and claws, cattle, necrobacillosis, etiology, diagnostics, prevention measures, treatment.

**Corresponding author*

INTRODUCTION

In modern cattle breeding cows are constantly exposed to stress due to high concentration of animals in confined areas, stable keeping, mechanization of the main production processes, and silage type of feeding. It leads to various diseases, including necrobacillosis and diseases of digits and claws of non-infectious and infectious etiology [1, 2].

BOD is found in almost every agricultural enterprise engaged in cattle breeding. According to the latest data, there are more than 18 names of BOD occurring in various combinations [3]. In dairy cattle breeding BOD of non-infectious and infectious etiology affects from 18 to 55% of livestock population. Animals with signs of out limbs affection quickly lose body weight and productivity. Depending on the form of BOD and the degree of claws damage, milk yield decreases from 10 to 80% and up to 16% of dairy cows are weeded out. The greatest economic damage is caused by necrobacillosis[4,5,6,7,8,9,10,11,12].

The purpose of the research is the development and practical application of methods for diagnosis, prevention and treatment of BOD in cattle.

MATERIALS AND METHODS

The object of the research is sick cattle with signs of out limbs' affection with clinical, epizootological and path anatomical characteristics typical for necrobacillosis. Diagnostic studies of pathological and biological material of 218 animals were performed according to the "Methodology Guidelines for Laboratory Diagnostics of Necrobacillosis" [13].

All BOD were divided into non-infectious (traumatic and caused by abnormal feeding and livestock management), infectious (necrobacillosis and Mortellaro's disease) and mixed infections (unguillomatosis).

According to the clinical signs and severity of disease development, the BOD was divided into three levels: mild, moderate, severe. The diagnosis was made comprehensively with the account of epizootological situation, as well as clinical and path morphological signs of animals diseases.

Postmortem materials were used to make the diagnosis. These are the affected digits along the fetlock joint, pieces of parenchyma organs - the heart, liver, lungs, kidneys, pieces of the ventricle and intestine with loci of necrosis, as well as intravital biomaterial - vital pieces of the affected digit of animals that were not treated. To deliver biomaterial to the laboratory, it was placed in special transport media, and postmortem material was placed in barrier bags in fresh or frozen condition.

Suspensions of pathological and biological materials were studied with the help of common bacteriological and mycological methods with the use of bioassay in our modification followed by isolation of the causative agent of necrobacillosis from infected laboratory animals.

Materials suspensions were inoculated on the nutrient media of Kitt-Tarozzi, Sabouraud, Grigorak, Plaut, beef-extract broth, and meat infusion agar.

Necrobacillosis was registered only in cases when the diagnosis was confirmed by release of the pathogenic strain *F. necrophorum*.

Diagnostics of other BODs was carried out according to the characteristic clinical and path anatomical signs and the results of laboratory studies.

RESULTS

Clinical and epizootological examination of cattle in 415 agricultural enterprises with different technology of keeping and exploitation of animals showed that in 71.8% of enterprises the cause of necrobacillosis and other BODs of non-infectious etiology was the importation of cattle from unfavorable farms, as well as violations of conditions of animals keeping and feeding.

The majority of highly productive cows from mega complexes with loose keeping on concrete floor had affections of digits and claws. In particular, the majority of cases were noted in the last period of pregnancy and soon after calving. It led to a sharp decline in milk production in relation to severity of the process. The number of sick animals in the agricultural enterprises was from 9.3 to 76%. BOD in cows reached 26 - 52%, in heifers - 37.8 - 42%. High morbidity rate was observed in feeder bulls in the second half of fattening (up to 65%).

Animals of black-and-white and Holstein breeds were more susceptible to diseases (42.5%) than animals of Simmental and Bestuzhev breeds (13.5%). Incidence of BOD in Holstein cattle was higher.

Affection of the distal part of hind limbs was registered more often (up to 87.9%).

Long-time standing of the animals on concrete floor led to aseptic inflammation of the matrix and affection of the claw horn in the form of laminitis, pod dermatitis, Rousterholz Ulcer, white line disease, etc. These diseases were subsequently infected with pyogenic bacteria and *F. necrophorum*. Constant use of litter made of straw, sawdust, and peat and correct use of rubber mats reduced incidence by 10-15%.

In most cases BOD of infectious etiology (necrobacillosis, Mortellaro's disease, mixed infections) were characterized by purulonecrotic affections of digit soft tissues: ulcers, abscesses, phlegm on in the area of the crumb, the arch of the interclaw cleft, corolla and dewclaws.

If all the cases of BOD over a year are 100%, then in traditional dairy farms with pasturage or camping of cattle in the warm season BOD was registered mainly in winter-spring periods (up to 40.5%), and in industrial complexes with year-round zero pasture of animals BOD and necrobacillosis were registered all year round (up to 59% of the total number of animals).

It should be noted that in the reproductive agricultural enterprises, where veterinarians took into account all cases of violation of keeping conditions and feeding and corrected them in time, BOD was in the range of 3-10%. At the same time, in mega complexes where qualified orthopedists worked all the time, special machines, tools and medicines were available, the morbidity rate usually did not decrease below 25-30%. Diseased animals released pathogenic isolates of the causative agent of necrobacillosis and other microorganisms. Therefore, it is advisable to have a resident orthopedist and a veterinarian in every agricultural enterprise and to take complex medical and preventive measures that correspond to the production technology. If animals are not treated in time, affections of non-contagious etiology are infected with pathogenic pyogenic micro flora, and mixed bacterial fungal infections or unguilomycosis appear. BOD develops and proceeds in the form of polyinfections, and under certain conditions the whole herd can be infected.

In the majority of examined agricultural enterprises the percentage of sick animals with an initial mild degree of disease was 30-40%, with moderate degree - 60-70%, and with severe degree - 10-15%. It was assumed that the main factors of BOD dispersion were untimely culling of seriously ill animals and incorrect implementation or absence of veterinary, sanitary and medical preventive measures.

During laboratory diagnostic studies the microscopy of smears from the affected areas of claws tissues was made. *F. necrophorum* was found in a group of 5-6 or more species of other microorganisms. Among them there were micrococci (86.4%), staphylococci (77.3%), streptococci (57, 3%), enterococci (18.2%), *Escherichia* (45.5%) and *Olms* (31.8%). In addition, the smears contained sporadic coiled gram-negative rods that are characteristic of spirochetes. However, methods of isolation and identification of these microorganisms (spirochetes) are not developed, since they are not cultivated on artificial nutrient media and a suitable model for a bioassay is not found.

It is known that necrobacillosis and Mortellaro's disease are of mass nature and are most malignant in calved cows and first-calf cows. In this case animals have lameness on one or two limbs.

These diseases appeared due to livestock keeping in damp premises where carriers of these infections and sick animals lived before.

A distinctive feature of Mortellaro's disease was the fact that necrotic processes and affected areas usually occurred without visible traumas on the skin of digits. In addition, in case of necrobacillosis foci of necrosis were found on the udder, mucous membranes of the oral cavity, the gastrointestinal tract, the genital organs (vagina, uterus, preputial sheath), in the lungs, heart and liver. An agent of necrobacillosis was found during bacteriological studies of pathological material from sick animals with a bioassay on laboratory animals. In case of Mortellaro's disease, a clinical picture was not characteristic of necrobacillosis.

In case of Mortellaro's disease, the pathological process usually began on the superficial skin layers of the cattle digits due to their prolonged maceration with the subsequent migration to deeper tissues.

In several agricultural enterprises cows had a torose horn with grooves filled with manure. During microscopy of smears bacteria and fungi that are characteristic of ungilomycosis were found.

On 5-7th day of inoculation on the nutrient media of Sabouraud, Grigorak and Suslo the associations of keratomycetes (trichophyton, candida, mucor, mold) that led to necrosis of the horn were found. Fungi dissected the horn of the sole and led to formation of crateriform ulcers that sometimes penetrated into matrix. It has been established that the products of fungi life penetrated into blood and lymph and local purulonecrotic process with a characteristic clinical picture of general and local intoxication developed.

In several agricultural enterprises affections of claws were found mainly in the area of the crumb in the form of "cauliflower". In addition, the claws were poorly cornified; they acquired an ugly shape without visible edges of the wall and the sole. According to the data from specialized literature, such affections are characteristic of cytomegalovirus infection and antiviral medications are used to treat them.

It should be noted that ungilomycosis and pathology of claws caused by herpesvirus are found quite often. However, nowadays they do not have independent nosological significance and contribute significantly to BOD dispersion.

Regular cleaning and clipping of claws, keeping track of the claws state for the absence of fungal and viral affections, pinches, bruises, chronic arthritis, tendinitis, and early treatment can effectively prevent appearance of BOD of infectious etiology.

Thus, during research the following affections of claws of non-infectious etiology were registered: sword-cut and contused wounds, laminitis, pod dermatitis, limax, white line disease, Rusterholz Ulcer, etc. They were infected with pathogenic pyogenic micro flora and the causative agent of necrobacillosis.

It is necessary to treat animals with BOD of various etiologies after making a presumptive diagnosis beginning with cleaning and functional clipping with accuracy to sizes and angles of the claws.

Cleaning of the wound surface helps to reduce pressure on the surrounding inflammation of the claw tissue, as well as to ease pain reaction and to enhance rush of oxygenated blood to the nidus of infection. To prevent secondary purulonecrotic processes in the area of claws and to strengthen the claw horn, all animals should take daily foot baths with a 10% aqueous solution of copper or zinc sulphates, a 4% solution of formalin or other disinfectants registered in Russia.

If it was necessary, surgical treatment was given. The necrotic tissues were carefully removed, the wound was sanitized, claws were manipulated with antibacterial agents, and gauze or plaster bandages were used.

Antiseptic preparation of the wound and treatment with the account the phases (hydration, dehydration, organization and epithelization of the wound) and proper shaping of the claw provided its functional recovery, normal setting of the limb and prevented BOD relapses.

A highly qualified full-time orthopedist who has a crate for animals and all necessary tools, medicines and dressing material, who keeps a constant record of sick animals, regular cleaning and proper clipping of claws, timely group or individual treatment of animals, is able to maintain well-being of cattle.

Prolonged antibacterial agents like Fusobacsan, Bimoxyl LA, Tetroxy LA ("Bimeda"), Tetralong-20, Exenel RTU or Pfizer and others have been successfully used intramuscularly to effectively destroy parasitic microorganisms in affected claws. In the initial (mild) degree of BOD they have 100% efficiency.

In case of moderate degree of BOD, it is necessary to use chelate compounds of copper and zinc, fusosan, PulverisEdis, powders of Plakhotin and Ostrovsky after surgical treatment. Effectiveness of these agents was significantly increased when they were used in combination with prolonged antibiotics.

The above mentioned medications are used to prevent BOD in heifers in the last stage of the dry period. They do not get into milk.

A napkin with the 10% solution of mebitisol (2-mercapto-benzothiazole) on DMSO is used to treat unguilomycosis fixing it with a gauze bandage and changing the napkin with mebitisol every 5 days.

In case of necrobacillosis appearance, it is necessary to take planned veterinary and sanitary measures with the use of active and passive prophylaxis with a highly specific vaccine and hyperimmune serum and take into account specificity of the field and vaccine strain of the necrobacillosis causative agent. Specific preventive measures to control Mortellaro's disease are not developed. It is necessary to strictly follow veterinary and sanitary requirements and to create comfortable conditions for cows: a dry stall with good litter and individual and group treatment with the help of foot baths and disinfection mats with solutions of disinfectants. It is recommended to use an Acyclovir ointment on 30% dimethyl sulfoxide to treat cytomegalovirus infection.

CONCLUSION

BOD are multivariable pathologies (non-infectious, bacterial, viral, fungal) of cattle out limbs caused by a decrease in general and local resistance of the organism and infection contamination of claws tissues that can be exogenous and endogenous. The main causes of BOD appearance are violations of keeping, feeding and practical use of cattle. Spread of BPC is caused by untimely diagnosis and taking of medical preventive measures. It is important to take into account BOD etiology, individual and herd diagnosis, severity of affection (mild, moderate and severe).

REFERENCES

- [1] S. Lopatin Optimization of the control system of necrobacillosis epidemic process in cattle. Novosibirsk 2006: 43.
- [2] Lischer C. J. Tierärztl. Prax. 1994; 22: 424-432.
- [3] A. Samovolov Necrobacillosis of cattle. Novosibirsk 1998: 140.
- [4] Greenough P. Proceedings of the 14th International Symposium and 6th Conference on Lameness in Ruminants, Uruguay 2006: 6-9.
- [5] Costerton W. et al. Clin. Invest. 2003; 112: 66-77.
- [6] Nuusket al. Erkrankungen der Klauen und Zehen des Rindes. Schattauer 2004: 63-76.
- [7] Steiner A. Reflections on the prevention of claw disease in cattle 14th International Symposium and 6th Conference on Lameness in Ruminants, Uruguay, 2006: 11-15.
- [8] Campbell J. R. Can. Vet. 2005; 2: 145-149.
- [9] Bargai U. Subclinical Laminitis (SL) in Israeli dairy cattle Proceedings of 10th International Symposium on Lameness in Ruminants, Lucerne, Switzerland, 1998: 149-151.
- [10] Stone W. C. Dairy Sci. 2004; 87: 13-26.
- [11] Shaver R. Proceedings of the 8th International Symposium on Disorders of the Ruminant Digit and International Conference on Bovine Lameness, Banff, Canada, 1994: 383-396.
- [12] Shearer J. College of Veterinary Medicine University of Florida 2005: 8-21.
- [13] Methodology guidelines on laboratory diagnostics of necrobacillosis, Moscow 1987: 5.