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The role of general measures in preventing cattle finger and hoof diseases

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Abstract.

The research was aimed at studying the role of general measures in preventing cattle finger and hoof diseases (FHD) and held during 1990 and 2017 in farms affected by FHD that had used the vaccine against necrobacillosis and therapeutic agents. The authors considered the risks of FHD outbreak and spread in cows depending on fractions, epizootic situation in the farm by these diseases, the system and conditions of cattle housing, feeding, exercise area, bedding, and the methods and terms of foot cleaning and trimming, group or individual therapies conducted in farms. The epizootic situation and efficiency of general and special veterinary sanitary measures against cattle finger and hoof diseases were studied by the farms affected by these diseases according to the recommended methodology, with the final diagnosis made by the laboratory methods according to the methodology worked out by the authors. The organization and coordination of general, zootechnic and veterinary sanitary measures was aimed at good cattle health and minimizing FHD outbreak and spread, with the focus on the most critical period for cows and heifers – before and after calving. The introduction of comprehensive general, special zootechnic and veterinary sanitary measures contributed to the dramatic drop in FHD outbreak and spread, increased efficiency of the conducted work and enabled animal health after non-contagious and infectious FHD in each affected farm.

Key words: cattle foot and hoof diseases (FHD), prevention, treatment, general measures.

INTRODUCTION.

Intensive dairy stockbreeding accompanied by livestock density on limited patches and year-round loose or tie-up indoor housing on wet concrete floor without bedding causes macerations and microtraumas distorts skin barrier functions at the distal limbs [1,2]. Permanent stress, feeding without regard for the needs and productivity, intensive milking, gynaecological diseases, frequent dispositioning cause discomfort and suppress immune system, health and productivity [3,4]. These factors tend to result in many cattle pathologies extremely detrimental to agriculture, with FHD being among the highest of them.

In our country, nonliving vaccines are used for the specific prophylaxis of cattle necrobacillosis, including the formol-emulsive vaccine developed at the Federal Center for Toxicological, Radiation and Biological Safety. However, the efficiency of these species mostly depends on correct general measures aimed at improving housing and feeding [5].

Accordingly, the research was aimed at studying the role of general measures in preventing cattle FHD.

MATERIAL AND METHODS.

The research was held during 1990 and 2017 in farms affected by FHD that had used the formol-emulsive vaccine against necrobacillosis and therapeutic agents Fusobaksan, etc.

The authors considered the risks of FHD outbreak and spread in cows depending on fractions, epizootic situation in the farm by these diseases, the system and conditions of cattle housing, feeding, exercise area, bedding, and the methods and terms of foot cleaning and trimming, group or individual therapies conducted in farms.

The clinicoepizootological examination was conducted according to the Recommended Practices for the Comprehensive Cattle Health Survey, 1988 and the Recommendations on the Epizootological Examination Methodology, 1975.

Clinical diagnosis was followed by taking biological materials from diseased animals and making the final diagnosis by the laboratory methods according to the Methodology, 2017, worked out by the authors.

RESULTS AND DISCUSSION.

The comparative study of the housing, feeding and use conditions influencing immune and clinic status of the cows vaccinated by the formol-emulsive vaccine in the farms affected by FHD enabled to find out the following reguliarities (see Table).

Early and necessary general and special veterinary sanitary measures had positive impacts on cattle health and productivity. Thus, the use of foot baths for two years reduced the number of FHD by 24 per cent, active exercise – by 16 per cent, hoof trimming and cleaning – by 18 per cent, while only a handful of animals were affected by FHD in the case of the joint use of therapeutic agents.

However, highly productive animals imported from abroad within the period from 1993 to 2006, in spite of considerable funding, revealed higher percentage of FHD as compared with local cattle. An immune response to the formol-emulsive vaccine was less expressed during the whole research time frame.

The comparative analysis of the clinical and immune biological research stated that tied housed cows had revealed a smaller proportion of the diseased as compared with the loose ones widely introduced across farms. This is probably due to the adaptation of cows to loose housing,

competition among animals and the lack of nursing in contrast to the tied housing. Both groups showed the same antibody titer during the whole research time frame. Therefore, the adoption of loose housing accompanied by the change of cow housing conditions and milkmen and animal breeders working conditions increased the proportion of FHD cases.

It should be noted that the use of summer camps where animals were pastured being tied or loosely during the housing season suspended FHD incidence while it was observed throughout the year in case of year-round in-door loose and tied breeding.

39 per cent of loosely housed animals showed affected thoracic limbs, 61 per cent – hind limbs, while 89 per cent of tied animals showed affected hind limbs. The simultaneous injury of two or more limbs was registered rarely (no more that 2-3 per cent of animals). The comparative study of cows and heifers revealed a larger proportion of the diseased among first and second lactation cows. Without being injured, loosely housed out-door heifers escaped FHD.

However, the decline in FHD incidence in relation to loose housing system was registered in the farms properly arranging general measures.

In particular, FHD incidence reached 18 per cent in the farms where animals were never not left from the room in winter during housing season because of the absence or ineffectiveness of fixation. When these farms organized active exercise among cows while running them through special routes, practiced active exercise across the paddock or used large cards with hay cocks about 500 meters away from rooms, FHD was reduced by 2.6 times. Actively exercising vaccinated animals showed increased antibody titers during the whole research time frame. However, FHD incidence was lower (2.4 per cent) in the group of vaccinated cows than among the vaccinated ones housed without exercise (4 per cent). Thus, FHD incidence accompanied by tied and loose housing was connected with hypodynamy because of lack of exercise and insolation among cows.

The overall provision of forage during in-door period varies greatly across different farms. The analysis of cattle feeding revealed the amount of concentrated feedstuff up to 2 kilogram in 31 per cent of farms, 3 kilogram – in 48 per cent of farms, over 3 kilogram – in 21 per cent of farms. 19 per cent of farms in the study did not use hay, 66 per cent of farms fed cows with 1-2 kilogram of hay, and only 15 per cent of farms – with 3-4 kilogram of hay. The basic feed of cow rations was ensilage and forage fodder: less than 15 kilogram in 18 per cent of farms, less than 20 kilogram in 34 per cent of farms, less than 30 kilogram in 35 per cent of farms, more than 35 kilogram in 13 per cent of farms. Furthermore, with lack or low proportion of hay in the ration, most affected farms fed cattle with low quality ensilage and haylage, which increased FHD incidence. We noted the lack of tuber crops in the rations of mot farms, which resulted in a calcium deficiency. Livestock health in FHD depended on the amount of feed units being eaten by animals. The higher it was, the lower FHD incidence it was accompanied with: 6.8 feed units – 8-14 per cent of cows, 11.0-13.0 feed units – 2.9-3.6 per cent of cows.

As accompanied by a well-balanced ration with 10 feed units, FHD incidence varied greatly depending on the proportion of hay in the diet. Most farms used monofood, with small amount of bulk food; haylage, ensilage and concentrated feedstuff are mostly used.

Hay deficiency resulted in 17 per cent of FHD incidence, while 3-4 kilogram of hay in the ration resulted in less than 2.5 per cent of the diseased cows. In two years after vaccination, the cows that had been fed with up to 30 per cent of hay during in-door period showed reduced FHD incidence from 17 to 1.1 per cent.

Thus, the main factor influencing FHD incidence was a metabolic disorder connected with the lack of bulk food in the ration.

The results of blood serum chemistry of conventionally healthy animals revealed most indicators within the bottom border, while the diseased - below normal. The content of carotene, calcium and alkali reserve varied mostly throughout the year. They were much lower in winter and spring as compared with summer. The cows in affected farms revealed the deficiency of vitamins, sugar, iodine, cobalt, CF zink, calcium, manganum, cuprum. The sugar-protein ration was below normal from 0.34 to 0.50.

Metabolic disorders and FHD were registered among bred heifers and the newly-calved, they were differentiated as a separate technological group, however, most farms did not pay sufficient attention to the preparation and before and after calving. Hay up to 10 kilogram, ensilage and haylage – no more than 10-15 kilogram, concentrated feedstuff – 1.5 kilogram were introduced in the ration of cows, they were monthly vitaminized with trivit or tetravit. All animals were given polysalt per head: cobalt – 12 mg, cuprum – 75 mg, zinc – 35 mg, iodic potassium – 2 mg, citric acid – 20 mg. Cows were injected intramuscularly with vitamin D at a dose of 10 mln units. After calving, resting place and the whole room every 40-45 days were sanitized. Under such circumstances, FHD incidence was less than 3-4 per cent in winter, while the antiepizootic efficacy of the vaccine was 87.7 per cent.

While conducting therapeutic and preventive measures in some farms, we repeatedly pointed out that abundant saccharified, brewery and alcoholic production residues in cow ration inevitably resulted in acidosis, ketosis, increased FHD and gynecopathy outbreak and spread, while hay and green forage, as well as feeding stuffs containing vitamin A, carotene and calcium, added in the ration reduced FHD incidence by 15 or more per cent.

In recent years, most farms entirely renounce bedding and arrange rubber blankets in livestock buildings, feeding and drift fence zones, cradles in order to reduce the burden on claw horns. However, these do not solve the problem of moisture. Thus, more than 100 buildings in the study showed moisture constantly in 28 per cent of cases, periodically – in 60 and never – in 12 per cent of cases. In these buildings, FHD incidence amounted to 15-25, 8-19 and 2-3.5 per cent respectively. The continuous impact of stale and fecal masses by bedless housing results in macerated skin and spongy hoof impairing protective

properties. Bedding with chopped straw, dust or peat is particularly important by in-door cattle housing. Qualitative bedding maintained normal moisture, while proper cleaning not rarely than 4-6 times a day and regular sanitation sufficiently reduced microbial landscape, prevented finger injuries and increased the efficiency of preventive vaccination and animal therapy.

For the purpose of farms sanitation and infectious FHD preventive therapy general veterinary and sanitary measures are used to prevent injuries, macerated skin and the diseased animals therapy [6,7]. The use of foot baths is a very technological and effective way to extend the use of productive animals and increase agricultural profitability [8,9]. Animal limb baths with cuprous sulphate solution (2-10 per cent) and formaline (2-5 per cent) are widely recommended that had been suggested in the 1940-50s. The basic tubs are rectangular containers of an inert material 7-10 meters long, 1.5-2 meters wide cm and 30 cm deep. Portable plastic foot tubs are widely used in recent years. Single filling of a tub with the solution is enough to sanitate 100-200 animal units depending on hoof pollution. Foot tubs are arranged along animal tracks, usually at the exit from the lactorium and filled with one of many disinfectants (3% sodium chloride, 10% copper sulfate, 10% zink sulfate, 4% formaline, 4hoovs, pediline, etc.), which ae becoming more various. Such baths increase horn mechanical resistance and disinfect hooves. Farms practice different patterns. As a rule, preventive baths were used for 2-3 days with a two-week interval, with the interval being changed.

Food baths were more effective after hoof debridement. Hoof douching with the above mentioned disinfectants is effective by tied housing, too, with ‘dry baths’ with the mixture of cupric sulphate and slaked lime or ciolite powder at the ratio 1:9 organized not rarely than once a week.

In our study, group unspecific and specific preventive measures against necrobacillosis with the use of foot baths accompanied by cattle immunization with the formol-emulsive vaccine resulted in full recovery of cow population from this infection and reduced FHD incidence to 1.1 per cent, while vaccination without foot baths was less effective – 4.1 per cent of FHD cases.

Table – Clinical and Immunobiological Status of Vaccinated Cows in Various Housing and Feeding Conditions

Group n=25-50 animal units	**Indicator**	**Follow-up period (months)**				
		0	**6**	**12**	**18**	**24**
Local cattle	A	13	6,3	3,7	2,7	2,5
	B	30±5	186±57,6	416±10,7	576±71,6	640±0
Imported cattle	A	15	10.2	6.7	4,3	4,1
	B	Neg.	208±53,7	240±40	320±0	480±80
Loose housing	A	35	8,7	5,1	4,2	3,6
	B	25±4,3	160±0	186,7±43	240±40	320±0
Tied housing	A	30	5,6	2,3	1,1	2,1
	B	25±4,3	160±0	320±0	240±40	512±87,6
Without exercising	A	18	10	7.8	5.3	4.1
	B	15±2,5	160±0	320±0	640±0	560±69,3
Active exercising	A	18	8	4,3	3,6	2,4
	B	10±0	320±0	560±69,3	640±0	640±0
Usual diet	A	17	12	3,7	2,5	1,7
	B	Neg.	186±57,6	240±40	640±0	640±0
The diet with 30 per cent hay	A	17	8	1,6	1,4	1,1
	B	Neg.	320±0	576±71,6	560±69,3	640±0
With bedding	A	25±4,3	10	5	4,7	2,6
	B	Neg.	240±40	320±0	640±0	512±87,6
With bedding	A	20±0	10,5	7,5	4,2	2,1
	B	Neg.	186±57,6	320±0	640±0	640±0
Without footbaths	A	27	15,1	5,1	3,8	4,1
	B	10±0	160±0	220±51,9	320±0	512±87,6
With footbaths	A	25	9,3	1,1	69	1,1
	B	15±2,5	320±0	640±0	320±0	560±69,3
Without hoof trimming	A	17	12,7	5,7	4,3	5,7
	B	25±4,3	160±0	320±0	240±40	320±0
With hoof trimming	A	18	3,5	1,7	1,1	0,8
	B	30±5	320±0	400±69,3	320±0	160±0
Without treatment	A	35	6,7	5,3	4,5	4,0
	B	30±5	133,3±16,3	240±40	416±97,3	560±69,3
Without treatment	A	35	1,5	1,9	units	units
	B	40±0	320±0	560±69,3	640±0	640±0

Key: A – percentage of finger and hoof diseases, B - antibody titer in conglutination reaction with the homologous antigen

While analyzing the impact of hoof cleaning and trimming on FHD incidence, affected farms acquired necessary instruments, detergents and disinfectants, arranged stalls to fix animals for preventive examination, hoof cleaning and trimming. FHD was defined by injury severity as light, moderate or serious. Accordingly, surgical therapy was held with the use of Fusobaxan and Fusosan. Hoof cleaning and trimming was held every 5-6 months. After hooves had been treated, animals were put into dry livestock buildings with chopped straw or dust bedding.

In the course of the study, we noted high efficiency of formol-emulsive vaccine when accompanied by hoof trimming and cleaning, when FHD incidence amounted to 0.8 per cent, while the lack of trimming increased FHD incidence to 5.7 per cent. Hoof cleaning and trimming without cattle vaccination was characterized by disease recurrence 3-4 month after their conducting.

In the farms where 35 per cent of livestock population were affected by FHD, animals were treated with the complex use of Fusobaxan and Fusosan. The results of preventive vaccination in these farms had high antiepizootic efficacy enabling to cure the population from necrobacillosis and maximally revert FHD of another aetiology.

The bacteriological studies of the biological materia taken from animals affected by FHD in 3-6 month after the measures revealed no pathogenic strain F. necrophorum.

Stressful situations among first-calf heifers and cows become aggravated in a crucial period of their life – the last day before and two weeks after calving. They usually result in FHD outbreak and other pathologies. FHD signs usually are more acute during the first week after calving: during the first day – among 77 per cent, in 4-5 days – among 23 per cent of cows, while in 7 per cent of cases the disease is revealed few hours before calving, that is why animals require close attention in this period. The faster the disease is growing, the heavier it is presenting and the more difficult it is to cure. 99 per cent of cows recover if appropriately treated (during the first or second day). The infection may progress fast, an animal recovers rarely and FHD becomes chronic without medical assistance.

In the herds affected by FHD, preventive sanitation of dry cows, bred heifers in the last week before calving with Fusobaxan allowed to reduce the incidence by 30 times as compared with untreated animals during the period of probable outbreak of finger and hoof pathologies. Single intramuscular dosing of 8-10 ml Fusobaxan for preventive purposes to this group of animals enabled to delink the epizootic chain.

The systematic use of Fusobaxan and Fusosan, other medicines accompanied by preventive vaccination, proper culling of infected animals, foot baths or bactericidal pads enabled to cure the population from necrobacteriosis and cut severely the number of diseased animals in dozens of farms in different Russian subjects within 1.5-2 years.

While treating animals, the use of these medicines required lower costs and less time and enabled to take timely and efficient therapeutic and preventive measures.

CONCLUSION.

The results of the longstanding study imply that complex organization of general, zootechnic and special veterinary and sanitary measures enables cattle population to recover from necrobacteriosis in affected farms and reduce sharply FHD incidence of non-contagious and infectious aetiology within 1.5-2 years.

To do this, every farm should take into account the cause-effect of FHD and introduce general measures being an integral part of high-quality production technology and therefore the concern of both veterinarians and all farmers.

A particular attention should be paid to the most crucial period of cows and bred heifers' life – before and after calving.

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