S U M M A R Y

RESEARCH ON THE OPTIMIZATION OF THE PROTOCOLS OF CLINICAL-THERAPEUTIC APPROACH IN ENTEROPATHIES OF YOUNG BUFFALOES FROM BRASOV COUNTY

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*The doctoral thesis, entitled **Research on the optimization of clinical-therapeutic approach protocols in the enteropathies of young buffalo from Brașov county**, is structured according to the canons, in two main parts:*

Part I is represented by the Bibliographic Study, which contains a number of 53 pages, equivalent to 32.3% of the total volume of this thesis.

Part II, Personal research, comprises 112 pages, which represents 67.6% of the volume of the thesis.

The present study was carried out between September 2022 and September 2023, a total number of 44 buffaloes were evaluated and monitored, coming both from the intensive system - from the SC Transylvanian Natural Product SRL farm, Mesendorf town, Brașov county, as well as from the household system, Hoghiz town, Brașov county.

Enteropathies are a group of gastrointestinal diseases, with different etiology, which constitute the most serious pathology among buffaloes, and which can cause a high percentage of morbidity and mortality, especially in newborn and young animals, having as repercussions, considerable economic losses.

The etiology of diarrhea in this species is multiple, including different infectious agents, parasites, poor management, nutritional factors, but also non-infectious causes. In this context, the complexity of the causal factors, as well as their variously associated intervention, correlated, at the same time, with the entanglement of physiopathological processes, make it necessary to approach the evolution of these processes sequentially, especially orienting towards a definite diagnosis and establishing an appropriate therapeutic protocol.

The pathogenesis of the investigated etiological agents consists in the modification of the health status of the individuals under study, which translates into malabsorption and maldigestion phenomena, with the destruction of the intestinal microbiota, phenomena that triggered diarrheal discharges.

Part I of this thesis is synthetically structured in two chapters.

Chapter I, from the first part, includes a bibliographic study regarding a short history related to buffaloes breeding in our country, which is a traditional activity. The main morphophysiological and reproductive characteristics of the individuals of this species are also described.

In chapter II, a series of anatomica land physiological peculiarities of the digestive system in ruminants are presented, the fermentative digestion being described in detail, but also some differences compared to cattle.

In the third chapter of the first part, general data on the hematological and biochemical profile in clinically healthy buffaloes are presented, data imperatively necessary for the early detection of organic and systemic pathologies, for the diagnosis and monitoring of the diseases evolution, but also for the interpretation of the response to treatment, as hematological and biochemical parameters are commonly used as indicators of health as well as nutritional status in animals. In this context, the average values of hematological and

biochemical parameters in clinically healthy calves were used to statistically interpret the results of the hematological and biochemical examination in calves with enteropathies (of infectious and parasitic origin).

In the last chapter of the first part, general data on diseases of the digestive system in ruminants were presented, the most frequently encountered digestive disorders with serious repercussions on the state of health being highlighted. Of course, a special emphasis was placed on enteropathies, because they recognize a high clinical polymorphism and can evolve alone or, sometimes, associated with gastritis (when they are called gastroenteropathies), which is why a careful clinical and therapeutic approach is required, in particular in newborns and youth, due to the incidence and implicitly, the seriousness of this condition.

Part II, that of "Personal research", is structured in two large chapters, followed by general conclusions and the bibliography, which contains a total number of 210 bibliographic references, cited in the text. It is worth mentioning that the research results were presented, synthetically, in 46 tables and 28 graphs, supplemented by 20 original figures.

The aim of this research was to offer a complex and detailed look at the physiopathological mechanisms that trigger digestive disorders in young buffalo (bred both in intensive and household systems), translated, in particular, by intestinal dysmicrobism and diarrhea, but also, on their clinical consequences, in order to establish a definite diagnosis and an appropriate therapeutic management.

The studies carried out in this thesis provide complex and very valuable information, necessary for the optimization of the management practices in buffalo farms, with a special emphasis on improving the quality of life of the animals and reducing stress, precisely to reduce the incidence of diseases (parasitic, infectious etc.), especially at a young age, aspects that contribute to the optimization of meat production but, in particular, to the optimization of milk production, by transforming it into specific and quality products.

The first chapter of part II is entitled "Studies regarding the clinical-therapeutic approach in enteropathies of infectious origin in young buffaloes", and includes, initially, the presentation of the study group, made up of 16 individuals, young buffaloes aged between 4 -10 weeks.

In order to select the individuals from this study group, first of all, the coproparasitological examination of each individual was carried out (to detect possible gastrointestinal parasites), in order to eliminate from this study the calves that had diarrhea of parasitic origin. After that, it was performed a centralization of the data regarding the history and clinical examination of each individual, also performing their hematological and biochemical screening.

In this context, in order to statistically interpret the results of the hematological and biochemical examination in calves with enteropathies of infectious origin, a control group was also formed, consisting of clinically healthy young buffalo (with an average age, close to that of the individuals in the study group), and the average values of the parameters determined following the hematological and biochemical examination, were used as reference values.

Following the clinical examination of the calves from the group with enteropathies of infectious origin, it can be noted that most of the individuals from the study group were apathetic and febrile. Although often present early, fever was absent in most individuals at the time of the clinical signs onset, when endotoxemia and poor peripheral perfusion rendered the animal, often normothermic or hypothermic. Acute signs of depression, weakness, tachycardia, and dehydration predominated when, in particular, highly virulent strains of E. coli caused septicemia.

Muscle mass loss was found mainly in 25% of the calves, which presented anorexia for a long time. The lack of appetite, respectively, the absence of the sucking reflex, as a result of the digestive disorders present, was recorded in 62.5% of the individuals.

Following the dosing of serum proteins and their fractions, hypoalbuminemia and hyperglobulinemia were recorded in buffalo calves with enteropathies of infectious origin (in particular, with increased levels of α-globulin, such as haptoglobin that binds hemoglobin and has bacteriostatic properties, by preventing pathogens from using iron). In this context, hypoalbuminemia is associated with intestinal malabsorption, malnutrition and

inflammation, specific manifestations of enteropathies translated by diarrhea, and hyperglobulinemia, in particular, with increased levels of α-globulins, associated with infection and inflammation.

The decrease in serum sodium level ($p>0.05$) and the significant decrease ($p<0.05$) of the chloride ions in calves with enteropathies of infectious origin, can be attributed to their loss in large quantities, together with aqueous faecal matter. In this context, the absorption of Na^+ ions decreases and the secretion of Cl^- ions increases, mechanisms that exacerbate dehydration of the host organism.

Hyperkalemia in calves with diarrhea - which is directly related to disturbances in acid-base balance - is due to metabolic acidosis and dehydration of the body, because in these patients there is an increased exchange of hydrogen ions with potassium ions, together with reduced renal elimination of potassium.

The zinc level recorded a statistically significant decrease ($p<0.05$), a decrease attributed to the damage of the intestinal epithelium as a result of the atrophy of the intestinal villi (which results in malabsorption).

In buffalo calves with enteropathies of infectious origin, the average value of hematocrit registered a significant increase ($p<0.05$), while the average number of red blood cells and hemoglobin content registered decreases, but not significant ($p>0$ .05) from a statistical point of view, variations that are the consequence of dehydration, anorexia and diarrhea. In addition, the reduction in the number of red blood cells is also attributed to blood loss with repeated episodes of diarrhea. They also had leukopenia with neutrophilia and lymphopenia.

The therapeutic management of patients with enteropathies of infectious origin has been directed mainly to the treatment or prevention of septicemia (mainly Gram-negative) and bacteremia; decrease in the number of coliform bacteria in the proximal small intestine and in the abomasum; increase in non-specific resistance; restoring affected intestinal areas and preventing negative energy balance; and also very important is reducing calf stress.

Antimicrobial efficacy, along with oral rehydration treatment, was evaluated by the clinical response to this treatment, observing a significant reduction to disappearance of the dehydration degree and restoration of faecal consistency, as well as a reduction in signs of visceral pain.

In the second chapter of the second part, entitled "Studies regarding the clinical-therapeutic approach in enteropathies of parasitic origin in young buffaloes", were gathered 2 groups of calves (from both intensive and household systems) that presented a positive coproparasitological examination, and in which different parasitic forms were diagnosed.

It is worth mentioning that, after diarrhea, the most frequent clinical sign encountered in individuals with parasitic enteropathies were apathy (8/12), the animals were depressed and isolated, sometimes with kyphosis when they presented tenesmus and anorexia (7/12). The disturbance of intestinal peristalsis was determined, in particular, by the hypersecretion of gastrin, which together with the hypersecretion of cholecystokinin, led to a decrease in appetite and as a result of the intestinal dysfunctions and alterations, the processes of maldigestion and malabsorption were accentuated in all calves with enteropathies of parasitic origin. Feces of diseased animals were semi-liquid to watery in consistency and gray to yellowish-green in color, containing mucus and sometimes blood. Also, in all individuals studied, the perineum and tail were soiled with diarrheal faeces.

In most of the calves taken into the study, whether they were raised in an intensive system or in a household system, the coproparasitological examination frequently encountered Eimeria oocysts, and in 16.6% and 20% of them, respectively, polyparasitism.

In calves with coccidiosis, where the dominant clinical signs were dehydration and diarrhoea, a decrease in the average number of red blood cells was observed, a decrease which could, of course, be attributed to blood loss from the intestinal mucosa and blood loss with watery faeces. In them, the decrease in the average value of the hematocrit, but also of the hemoglobin content, was found, which was attributed to hemoconcentration, dehydration, anorexia and loss. The decrease in the average number of leukocytes and the inversion of the ratio

between neutrophils and lymphocytes within the leukocyte formula, in sick animals can be attributed to the stress caused by malnutrition, following diarrhea and dehydration.

A significant ($p<0.05$) decrease in serum zinc levels due to its malabsorption and also its loss during diarrheal episodes may contribute to skin changes including scaling, crusting, pruritus, and hair loss.

The treatment of animals that presented parasitic enteropathies was based on the administration of specific anthelmintics (Baycox, Albendazole) according to each individual case, associated, of course, with symptomatic medication (antidiarrheal, rehydrating drugs), improving nutrition and stopping the infestation of animals, by their removal from the infested environment.