

ABSTRACT

Keywords: infectious diseases, colostrum, passive immunity, vaccination, calves.

The doctoral thesis entitled "**Considerations on the role of immune status in the prevention of infectious diseases in calves**" is structured, according to the rules in force, in two main parts: the first part, entitled "*Current state of knowledge*" which contains 35 pages and part 2, "*Personal Research*", with a number of 125 pages.

The doctoral thesis has a total volume of 174 pages and is illustrated with 23 tables and 73 figures.

The first part "**Current state of knowledge**" contains 4 chapters that briefly describe the data related to the physiology of the immune system of calves and the influence of colostrum in the acquisition of passive immunity in newborn calves. This section also summarizes notions of infectious pathology in the neonatal period, as well as currently available data on the role of immune status in the prevention of infectious diseases in calves. These data from the literature on the subject of the thesis were subsequently used to interpret and compare the results obtained in the second part.

The second part "**Personal Research**" is structured in 9 chapters, each representing in detail the results obtained during the doctoral studies, the last of which represents a synthesis of the final conclusions related to the research undertaken. Each chapter of this part has in its composition subchapters in which the research material and method are presented, the results obtained and the partial conclusions drawn from the conduct of each study.

CHAPTER 5 describes "**PhD thesis aim, objectives and the organizational framework of the researches**" of this doctoral thesis. The samples taken from the study were collected from a dairy farm with an intensive breeding system in Iași County. The analyzes of the samples were performed in specialized laboratories in Iași and Bacău. Also in this chapter are systematized the purpose and objectives of the doctoral thesis, which is intended to be a comprehensive study on the influence of immune status on the acquired resistance of newborn calves to neonatal diseases.

CHAPTER 6, entitled "**Epidemiological, clinical and anatomopathological investigations regarding the presence and prevalence of infectious diseases in calves**" presents the results of an epidemiological investigation that was conducted during 3 years of study, respectively in 2017-2019. The research aimed to identify infectious pathologies that affect newborn calves and to establish morbidity and mortality rates in the calf population studied.

The obtained results highlight the fact that, in the calf herd studied, the morbidity registered a rate of 6.20%, and the lethality rate was 15.10%, with a mortality rate of

0.94%. The morbidity of digestive diseases occupies the first place, with an average of 60.89%, being followed by respiratory diseases which register an average of 39.11%.

Depending on the age groups that showed interest in this epidemiological investigation, we noticed that calves over 2 months of age were the most affected by respiratory diseases, and calves aged 0-1 months were predominantly digestive.

CHAPTER 7 presents "**Laboratory diagnostic in infectious diseases in calves**" in order to establish a definite diagnosis. The diagnostic methods were rapid immunochromatographic tests, bacteriological, serological, enzyme-linked immunosorbent assays and molecular biology techniques.

In calves with neonatal diarrhea, *Cryptosporidium parvum* was the most commonly detected pathogen (17.53%), followed by *Clostridium perfringens* (11.69%) and *E.coli* factor F5 (5.19%).

Mycoplasma bovis was the most common pathogen detected in bronchoalveolar lavage in 2-3 month old calves, in 10% of cases as a single pathogen, in 12.5% of cases in association with *Pasteurella multocida* and in 7, 5% of cases in association with *Pasteurella multocida*, *Histophilus somni* and bovine coronavirus. Bovine coronavirus was identified in only 5% of cases as a single pathogen, in 10% in association with *Mycoplasma bovis* and in 2.5% in association with *Pasteurella multocida*.

CHAPTER 8 highlights "**The Influence of colostrum consumption on total serum protein in newborn calves**". Total serum protein concentrations relative to calf age and colostrum consumption showed strongly significant changes in the first week of life. Of the total serum proteins, albumin was the most prominent protein fraction, accounting for 56.7% of total serum proteins at birth. The average concentration of γ -globulins at birth was only 0.24 g/l, but increased significantly the day after the intake of colostrum - 35.10 g/l. Total serum proteins are marked and significantly influenced by the age, growth and development of calves. Variable changes evaluated over the entire study period were found in all 6 protein fractions. They reflect the response of newborns to the intake of colostrum and changes in the environment in the neonatal period.

CHAPTER 9, entitled "**The influence of colostrum consumption on serum lactoferrin in newborn calves**" aimed to evaluate variations in serum lactoferrin concentrations following colostrum intake and the role of lactoferrin in the prevention of infectious diseases in calves. Lactoferrin from colostrum and bovine milk has become increasingly important due to its wide range of biological properties. In the present study, the mean serum lactoferrin concentration on day 0 (2.68 μ g/ml) increased approximately 2 times a day after colostrum intake (5.24 μ g/ml). We also observed that the levels of serum lactoferrin concentrations in newborn calves are dependent on the concentration of lactoferrin in the ingested colostrum and the amount of colostrum administered. In the comparative study performed on 2 groups of calves that received colostrum with different amounts of lactoferrin, the calves in the group that had a higher concentration of colostrum lactoferrin also had higher serum lactoferrin values.

Previous studies have shown that colostrum lactoferrin has an important role in neonatal immunity and there is a possibility to provide protection against disease. Following the comparative study of two groups of calves that received colostrum over different periods of time, we observed that the morbidity of clinical diarrhea was higher in group 1, which received colostrum only at birth (26.6%), compared to the group 2 (20%), which continued to receive colostrum daily, mixed in whole milk. Also, the mean duration of diarrhea in the cases recorded in group 1 was longer (3.5 days) compared to that recorded in group 2 (2.8 days), but the differences were not significant, the total duration of clinical symptoms being on average about 3 days in both groups. The duration of the specific and non-specific treatment applied had greater variations in group 1 (4-7 days) than in group 2 (3-5 days).

CHAPTER 10 presents "**The influence of colostrum consumption on serum haptoglobin in newborn calves**". Haptoglobin is a glycoprotein whose main function is to bind free hemoglobin in the blood. The haptoglobin-hemoglobin group also reduces the availability of heme residue from bacterial growth, therefore haptoglobin has an indirect antibacterial activity. In addition to its many biological functions, haptoglobin is involved in the host's defense responses to infection and inflammation. In newborns, the immune system is immature and endogenous haptoglobin production (based on research in humans) is thought to be low (Gruse ş.a., 2016).

The aim of this study was to evaluate changes in serum haptoglobin concentrations following colostrum intake. The statistical analysis of the obtained results showed that the average haptoglobin concentration registered low values at parturition (2.03 µg/ml), which increased discreetly, but significantly after the administration of colostrum (2.86 µg/ml).

Acute phase proteins are plasma proteins synthesized by hepatocytes in response to stress, infection, tissue damage, or inflammation. To test this hypothesis, we analyzed the blood samples of a sample of 20 calves, during the episodes of diarrhea and after healing. Serum haptoglobin concentrations were 5.8-fold higher in calves with diarrhea, with a statistically significant difference ($p < 0.001$) between diseased calves and recovered calves.

CHAPTER 11 contains a series of "**Investigations regarding the immune response of calves as a result of the application of an active immunization scheme**". The aim of this study was to evaluate the level of specific anti-BoRV, anti-BoCV and anti-E.coli F5 antibodies (K99) in the serum of pregnant cows, in colostrum and in the serum of newborn calves in order to highlight the passive immune transfer. Immune responses were compared based on antibody titers (evaluated by ELISA) found in the analyzed samples in cattle.

Following the active immunization of cows in the last gestation period, the specific antibody titers anti-bovine rotavirus, anti-bovine coronavirus and anti-E.coli F5 (K99) increased significantly in the experimental group compared to the control group, both in the serum of pregnant cows, as well as in colostrum, respectively in the serum of newborn calves. Calves are totally dependent on the passive transfer of specific antibodies via colostrum, as the presence of bovine anti-rotavirus, bovine anti-coronavirus or anti-E.coli F5 (K99) antibodies was not detected in the serum samples collected prior to colostrum. Regarding the impact of vaccination on infectious pathology in suffering calves, the morbidity of clinical diarrhea was higher in the group of calves born from unvaccinated dams (20%) compared to the group of calves born from vaccinated dams (13.6%), and the duration of specific and non-specific treatment applied had larger variations in the first case (3-7 days).

CHAPTER 12, entitled “**Researches regarding colostrum management and assessment of passive immune transfer in dairy farm**”, aimed to form an overview of colostrum management methods in cow farms in Romania and aimed at obtaining the most up-to-date information on the collection, handling, storage and administration of colostrum in calves, as well as the importance of these methods on the health of newborn calves. Understanding the role of information in identifying and improving colostrum management on farms is a key area of interest in animal welfare research. Increasing the awareness and education of farmers is directly proportional to improving the health of livestock.

CHAPTER 13 briefly presents a number of 30 **final conclusions and recommendations** extracted from the research undertaken in this doctoral thesis.

The bibliographic references sum up a number of 221 titles from the national and international literature. Also, in the content of the thesis are found the results of own research published in volumes of scientific papers held at the Symposiums with international participation organized by the Faculty of Veterinary Medicine Iasi during 2019-2020.