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INVESTIGATIONS REGARDING THE PARTICULARITIES OF NON-SPECIFIC RESISTANCE AT NEONATAL CALVES

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Abstract

The scientific investigations revealed in this research present the study in dynamics of blood immunological indices characteristic to non-specific resistance at the neonatal calves in different age periods. In the study are presented the aspects of these immunological indices, regarding their correlation in determining the cellular and humoral immunity. Important data reveal the correlation of the concentration of lymphocytic, leukocyte indices, the phagocytic, lysozyme and bactericidal activity, which justifies the importance of nonspecific humoral resistance of the newborn organism, which denotes the assimilation of antibodies by colostrum during the neonatal period as a result of the installation of colostrum immunity.
The initiation of these studies has demonstrated the importance of nonspecific or inborn immunity, constituting the first line of defense against pathogenic microbial agents at newborn animals.

Key words*: non-specific resistance, phagocytosis, lysozyme, bactericidal activity.*

INTRODUCTION

Non-specific resistance at the neonatal calves comprises many factors and mechanisms. It is well known, that the organism is defending through the skin integrity and through the mucous which acts as anatomical barriers to microbial invasion, and through diverse physiological mechanisms (Golban, 2015; Horhogea, 2015).

Many studies confirm the importance of immunoglobulins in mucosal secretion, out of which a specific interest is to immunoglobulin with protective, anti-infective IgA role. The normal microbial flora of both the skin and the mucous membrane is defended by a normal microbial microflora - saprophyte, consisting of non-pathogenic microbes, which prevents the pathogenic microbes from multiplying and penetrating into the body (Siloși, 2014).

Remarkably, in the non-specific resistance processes at neonatal animals, is presented an important mechanism of defense of the organism against infection - phagocytosis, the action of which is expressed by incorporation and destruction - the digestion of microbes by leucocytes, especially the cells of the reticulo endothelial system (Brocaw, 2013; Gâjâilă, 2002).

The bibliographic data denotes important aspects, regarding the importance of the anti-infective protection system, complement, which intervenes in the destruction of the germs that have entered in the blood. This humoral factor of nonspecific natural resistance gives the blood a bactericidal power and prevents the multiplication of microbes that have entered into the blood.

The age is another factor, meaning that infant calves have a "immaturity" in anti-infective defenses (Rosen, 2008; Tașbac, 2014).

Therefore, the non-specific or inborn immunity provides the first line of defense against pathogenic microbial agents at newborn animals. It consists of immune, non-specific, rapid and equally intense immune responses, indifferent of the type of pathogen, which are rare enough to completely eliminate cellular microbial infections and lack of immunological memory or a lasting protective immunity (Gâjâilă, 2003).

Currently, a number of research shows that immune function is essential for the human and animal body and therefore severe immune dysfunctions are incompatible with survival. Therefore, inappropriate activation of immune function has the consequence of initiating or progression of pathological states of

hypersensitivity and autoimmune diseases, which has shown interest in this study. For this reason, the objectives of these researches were to study the specificities of non-specific resistance in neonatal calves (Christopher et al., 2008; Andrieș et al., 2014).

MATERIALS AND METHODS

The investigations were performed in the laboratory of microbiology of the Faculty of Veterinary Medicine of the Moldavian State Agrarian University and in the private laboratory Sinevo from Chisinau municipality. Blood samples were taken from newborn calves up to 30 days old to perform the investigations.

Blood samples were collected from the heparin jugular vein based on the calculation of 0.3 ml of heparin to 10 ml of blood for anticoagulation. The samples were used to identify the number of leukocytes, lymphocytes, the opsono-phagocytic test, lysozyme activity and bactericidal activity.

RESULTS AND DISCUSSIONS

The results of immunological immune system investigations on non-specific immunity at the newborn calves show that leucocytes, lymphocytes, phagocytic indices of bactericidal activity and lysozyme vary in different stages of the age of the animals (Table 1).

Significant results of the indices of leukocytes and lymphocytes were recorded in calves aged of 5 and 10 days, constituting values white blood cells, namely, 8.20± 0.81 and 7.90 ± 0.81 compared to values obtained from calves aged 20 and 30 days, where the indices constituted the level of 6.95 ± 0.81 and 7.35 ± 0.81. At the same time, the number of lymphocytes was determined and assessed at newborn animals, which shows appreciable values at age 5 and 10 days, constituting 3.69 ± 0.81 and 3.71 ± 0.81 compared to calves aged 20 and 30 days constituting 3.90 ± 0.8 and 3.31 ± 0.81.

The dynamics of these indices demonstrates that during neonatal period at 5-day old calves the phagocytic activity constituted 52.33 ± 0.60, compared to the age of 10 days, which constituted 41.67 ± 0.65, which denotes a decrease expressed by various aspects of external factors that act on the newborn animal during the early days of life.

Table 1. Leukocyte and lymphocyte dynamics at neonatal calves depending on age, %

Age (days)	Leukocyte (thousands/mcl)	Lymphocyte (thousands/mcl)
5	8.20 ± 0.81	3.69 ± 0.81
10	7.90 ± 0.81	3.71 ± 0.81
20	6.95 ± 0.81	3.90 ± 0.81
30	7.35 ± 0.81	3.31 ± 0.81

The study of the immune defense mechanisms in the neonatal period at calves revealed various indices characteristic to phagocytic activity and intensity varying in different age groups. Thus, the indices of phagocytic activity in neonatal calves determined significant values at various age ranges (Table 2). These data indicate that animals have resistance to infectious germs.

Table 2.Indices on phagocytic activity at neonatal calves depending on age

Age	Phagocytic activity
5	52.33 ± 0.60
10	41.67 ± 0.65
20	38.56 ± 0.56
30	35.44 ± 0.47

Following the dynamics of phagocytic activity indices at the age of 20 and 30 days it was found that the values constituted 38.56 ± 0.56 and 35.44 ± 0.47, fact which confirms the diminution of the phagocytic processes at these animals.

In the immunological aspect, it can be observed that the phagocytic activity during this period of life of the neonatal calves is attributed to the first level of neutrophils, the rest being made by macrophages.

Therefore, phagocytic mechanisms induce two-way phenomena that are dependent on bacterial resistance: the first pathway without opsonization through direct interaction between the phagocytic cell and the antigen; and the second pathway with opsonization constitutes the interaction that requires an additional opsonin molecule that acts as an adapter between bacteria and leukocyte. In this context, phagocytosis continues with adhesion, then with the phase in which the pseudopods surround the bacterium. The final stage of

destruction provides complete digestion of the bacterium.

Relevant data were recorded, regarding the phagocytic intensity of neonatal animals in different age periods (Table 3).

From the results, it can be observed that the phagocytic intensity at neonatal animals at the age of 5 and 10 days determined significant values of 2.32 ± 0.02 and 1.83 ± 0.01 compared to the animals aged of 20 and 30 days, where these values constituted 1.78 ± 0.01 and 1.57 ± 0.01. Therefore, at neonatal animals the defense mechanisms are not triggered enough to protect the aggression of microorganisms, viruses and other pathogens.

Relevant data were recorded, regarding the phagocytic intensity of neonatal animals in different age periods (Table 3).

Table 3. Indices of phagocytic intensity at neonatal calves depending on age

Age	Phagocytic intensity
5	2.32 ± 0.02
10	1.83 ± 0.01
20	1.78 ± 0.01
30	1.57 ± 0.01

From the results, it can be observed that the phagocytic intensity at neonatal animals at the age of 5 days and 10 days determined significant values of 2.32 ± 0.02 and 1.83 ± 0.01 compared to the animals aged of 20 days and 30 days, where these values constituted 1.78 ± 0.01 and 1.57 ± 0.01. Therefore, at neonatal animals the defense mechanisms are not triggered enough to protect the aggression of microorganisms, viruses and other pathogens

Table 4. Indices of bactericidal activity at neonatal calves depending on age

Age	Bactericidal activity
5	35.91 ± 0.44
10	36.00 ± 0.25
20	37.27 ± 0.27
30	42.18 ± 0.42

Table 4 shows that in the neonatal period at calves aged of 5 days the bactericidal activity was 35.91 ± 0.44 compared to the age of 10 days, which constituted 36.00 ± 0.25, indicating an increase expressed by various aspects of humoral immunity that act on the newborn calf during the first few days of life after colostrum feeding. Following the dynamics of bactericidal activity indices at 20 and 30 days of age, it was found that the values constituted 37.27 ± 0.27 and 42.18 ± 0.42, which confirmed the establishment of newborn cow resistance and the installation of colostrum immunity.

Table 5. The level of lysozyme (%) in the serum of the neonatal calves serum depending on age

Age	Level of lysozyme
5	4.21 ± 0.01
10	4.32 ± 0.01
20	4.31 ± 0.01
30	4.14 ± 0.02

The analysis of the results related to the lysozyme activity at the neonatal calf serum (Table 5) shows that at the age of 5 days, the lysozyme level constituted 4.21 ± 0.01 compared to the age of 10 days, which constituted 4.32 ± 0.01, indicating an increasing characteristic of the action of non-specific mechanisms, which contributes to the intervention of the neonatal animal organism protection. Following the dynamics of the lysozyme indices at the age of 20 days and 30 days it was found that the values constituted 4.31 ± 0.01 and 4.14 ± 0.02, which confirms the decrease of the nonspecific resistance of the newborn calf.

These aspects interpret the insufficiency of the immune defense mechanisms by which they influence the animal orghanism.

In this context, the immune response is considered as a defense mechanism by which the body recognizes what is foreign to itself. Recognition of self as opposed to non-self is very precise and specific to each organism, therefore among the mechanisms that generate disease or favors chronicising an important role is played by the deregulation immune response expressed by the intervention of non-specific resistance factors on both the human and the animal body.

CONCLUSIONS

Non-specific immunity is the first line of defense against pathogenic microbial agents at neonatal calves. It consists of immune, non-specific, fast, and equally intense immune responses, regardless of the type of pathogen,

which are rare enough to completely eliminate microbial infections.

Evaluation of the mechanisms of non-specific resistance formation at the newborn animal organism provides the opportunity to follow the evolution of cellular and humoral responses that maintain immune homeostasis of the organism and are considered the principal in regulating the immune system.

There was an increase in lymphocytic, phagocytic, bactericidal and lysozyme activity over different periods of age by 1.19; 1.21; 1.26 and 1.3 times.

The study of the specific features of non-specific resistance at neonatal calves determined significant values in the appearance and dicreasing of the development of cellular and humoral immunity, proving that the animal body recognizes what is alien to itself and is able to present its immunological defense mechanisms against various infections.

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