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Sheep Estrosis. Pathogenetic Basis Of The Parasitic System.

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ABSTRACT

The features of the functioning of the parasitic system during the development of the preimaginal phases of Oestrusovis (Linnaeus 1758) in sheep and the responses of the host organism are described.

Keywords: estrosis, parasitic larvae, sheep, pathological changes, the host organism.

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INTRODUCTION

Miase is the invasion of warm-blooded larvae of some species of flies and gadflies, characterized by polymorphism of clinical signs depending on the localization of the parasite. There are facultative and obligate miases. The causative agents of obligate miasis are the larvae of parasitic species of flies and gadflies living in the tissues and organs of humans and animals.

In the scientific literature there is a significant number of publications relating to the estrosis of sheep, the causative agent of which is the hollow gadfly Oestrusovis (Linnaeus 1758 (this. Oestridae, detachment Diptera). Splash invasion is widespread and causes significant economic damage to sheep breeding caused by the death of animals, reducing their meat and wool productivity The relevance of the work done is due to the fact that the scientific basis for the functioning of the parasitic system during estrosis has not been studied enough. The purpose of the research was to study pathogenetic essence of the impact of parasitic larvae of sheep gadfly on the host organism, to determine the most vulnerable parts of the population in the development of the parasite and on this basis to develop an effective system for combating Estrosi sheep.

It is established that parasitism is characterized by obligate molecular-biochemical mechanisms of metabolism and energy, which act only when parasites and their masters retain the properties of living organisms in the time interval of the parasitic system. Modern science studies: morphology, biology, laboratory diagnostics, pathogenicity of pathogens of infectious diseases [11, 5], molecular bases, biocenotic relations and the evolutionary-genetic theory of parasitism [1, 2, 8, 10], structure, strategy, self-regulation processes, concepts stability of parasitic systems [9, 6, 7, 3, 4].

For example, the ecological concept of the functioning of the parasitic system treats parasitism as a form of relationship between two organisms of different species, one of which uses the other as a source of food and habitat. Such an approach to the problem under study is considered simplified, since the recognition of the host organism as the habitat of the parasite makes it difficult to understand the population and intrapopulational structure of different types of parasites, population dynamics, and their circulation in biocenoses. It is noted that the conjugate evolution of the parasite and the host, on the one hand, is demonstrated by improving the host's mechanisms for controlling the pathogen, on the other hand, by the diversity and optimization of the adaptation processes of the parasites in the host organism.

The main sites of localization of parasitic larvae of Oestrusovis are: the nasal cavity, the paranasal sinuses. The respiratory system is the link between the body and the external environment. In the phylogenesis of the respiratory system, a number of specific mechanisms have been formed that prevent adverse effects, most of which are associated with the mucous membrane of the nasal cavity and respiratory tract.

The near-nasal sinuses perform a number of important functions for the body: moisturizing and warming the air, thermal insulation of the brain, relief of the bones of the skull, and shock absorption during mechanical stress. The main function of the respiratory system, which includes the paranasal sinuses, is to conduct air. It has been established that during inhalation the air passes through the middle nasal passage, and during exhalation it passes through the lower one. This air distribution ensures optimum warming and moistening of the inhaled air.

The combination of cilia in the nasal cavity is the respiratory field, which provides the process of cleansing the mucous membrane - mucociliary clearance. The physiological importance of ciliated atrial activity lies in direction and strength. The main sign of pathological transformation of the shell is its thickness. Thickening of the mucosa is mediated by fibrinous accumulations in the subepithelial layer or by the presence of inflammation or its consequences.

With estrosis, inflammation occurs as a protective and adaptive local vascular-tissue reaction of an invasive animal organism in response to the introduction of parasites that cause damage to the mucous membrane. The subsequent development of the inflammatory process is accompanied by a change in blood circulation, an increase in the permeability of the walls of blood vessels - the migration of leukocytes to the sites of damage by the parasites of the animal mucous membrane.

Protection of the mucous membrane of the nasal cavity and paranasal sinuses is provided by a complex of nonspecific factors of general and local immunity. Respiratory epithelium is functionally related to the secretion of lysozyme, interferon, lactoferrin. Nonspecific cellular reaction is caused by polymorphonuclear, monocytic and macrophage phagocytosis.

The specific protection of the mucous membrane of the nasal cavity and paranasal sinuses is governed by the cooperation of the T and B lymphocytes of the respiratory epithelium. This interaction is defined as lymphoepithelial complex, or as a mucoassociated lymphoid tissue, which is the basis for the functioning of mucosal immunity, the production of secretory immunoglobulin A, which is recognized as a major factor in the immune defense of the nasal mucosa and paranasal sinuses from infectious agents.

Thus, the epithelium of the mucous membrane and interepithelial leukocytes are the main structural area of the immunological reaction. Damage to the epithelium not only creates the preconditions for contamination of the mucous membrane with microorganisms, but also contributes to the transformation of immunological homeostasis.

MATERIALS AND METHODS

A system analysis of the scientific literature suggests that estrosis is considered a local process. The leading place in the pathogenesis of this disease is assigned to the traumatic and toxic effects of sheep gadfly larvae on the host organism. The hypothesis of determining the pathogenetic essence of estrosis as a result of sensitization of the host organism by antigens (allergens) of parasitic larvae was not considered.

The object of the research was sheep, spontaneously infested by O. ovis larvae. It is known that in October-November, animals are exposed to infection by larvae of a sheep gadfly. In December and January, the parasitic larvae of the abdominal gadfly are in anabiotic state. From February to March-May, the larvae of O. ovis actively develop and leave to the environment for pupation. An important task of the research was the study of the nature of histomorphological changes in the localization of the larvae of a sheep gadfly.

RESULTS AND DISCUSSION

It was established that the morphological changes of the nasal mucosa in invasive sheep were of the nature of hyperergic inflammation. The severity of clinical signs of estrosis depended on the intensity of bovine invasion and the stage of development of the sheep gadfly larvae. In the studied areas of the mucous membrane of the nasal cavity and paranasal sinuses, morphological changes were revealed, affecting to varying degrees all structures of the mucous membrane that are pronounced focal in nature. The mucous membrane of the nasal cavity in the first days after infection of sheep with sheep gadfly larvae was pink-red, swollen. In the nasal passages, more or less mucous secretions were found.

Histological examination revealed damage to the surface of the epithelium of the mucous membrane of the nasal cavity. The epithelial layer was swollen, loosened, in some areas was absent. Foci of mucosal dystrophy of cells of the ciliated epithelium were demonstrated, some parts of which were represented by cell detritus — a structureless oxyphilic mass containing cell nuclei.

Dystrophic changes in the upper layers of the epithelium were characterized by noticeable swelling, cytoplasm vacuumization, and the disappearance of cilia. It was noted the proliferation of subepithelial layers, which was demonstrated by the pattern of irregular arrangement of cells of the mucous membrane of the nasal cavity with a noticeable thickening of the epithelial cover. The number of rows of epithelial cells increased, up to the metaplasia of the ciliated epithelium in the stratified squamous epithelium.

A part of the cylindrical cells were squared, as a result of which the surface layer of the multi-row epithelium became loose, with gaps between the remaining cells. The normal ratio of ciliated and goblet cells changed. In some areas, the number of goblet cells was sharply increased, their hypersecretion was observed, in some places macrocysts were found.

Focal accumulations of lymphoid proliferate with the presence of histiocytes and leukocytes were found in the submucosal layer, in places of pronounced changes in cellular elements. The leukocyte and lymphocytic infiltration of the stroma was uneven: more often diffuse, less often local.

The surface of the epithelium was covered with a layer of amorphous oxyphilic detritus of various thickness, sometimes with the presence of segmented leukocytes. Demonstrated areas of the mucosa with less pronounced changes that were covered with a layer of basophilic mucus.

At the locations on the mucous membrane of the dead larvae, a significant focal accumulation of eosinophils and neutrophilic leukocytes was observed. In adnexal cavities, clumps of dead larvae were observed. Postmortal disintegration of larvae of a sheep gadfly in some cases contributed to the development of purulent-necrotic rhinosinusitis with epithelial necrosis and underlying stroma. A large number of microorganisms were found here. Leukocyte infiltration was pronounced, there were perivascular hemorrhages around the dilated blood vessels.

At a later study period (March-April), when the larvae of a sheep gadfly reached the third stage of development, we detected loosening of the main substance of the submucosa, in some parts of its fiber were fragmented, fluid accumulated, and the submucosal layer was formed. In these areas, the mucous membrane of the nasal cavity was thickened to a greater or lesser extent.

Fluid circulation was disturbed, diffusion was carried out mainly from the venous and lymphatic vessels, which led to stagnation in the veins. Venous vessels were hyperemic, arterial - often sleeping, empty. Endochelial desquamation was noted in small venous vessels and arteries.

In the course of small vessels (often venous), focal (in the form of stripes) accumulation of small lymphoid proliferate cells with monocytes and plasma cells was noted. The same accumulation of cells was found around the strongly modified glands of the mucosal layer of their own, where secretory cells were almost completely absent. The mucous glands were filled with oxyphilic secretion, and their ducts were dilated.

The proliferation of subepithelial layers was recorded. It should be noted that the bulk of the proliferate was lymphoid cells: monocytes, fibroblasts, histiocytes, plasma cells, mast cells. The saturation of the mucosal stroma with cellular elements indicates the hyperaergic nature of the inflammatory process, which, quite obviously, can arise in response to the inflow of excretory-secretory antigens of parasitizing sheep gadfly larvae. Studied rhinocytogram (studies of nasal secretions in invasive animals), the results of which provide the possibility of differential diagnosis of allergic, inflammatory or vasomotor rhinitis. Normally, all the walls of the nasal cavity are covered with a mucous membrane with a secret that promotes the removal of microorganisms due to the presence of ciliated epithelium that has cilia that are capable of vibrating movements and moving mucus with microorganisms.

The larvae of a sheep gadfly, produce in the nasal cavity metabolic products of an allergenic nature. Along with the presence of larvae, in the nasal cavity and paranasal sinuses of sheep, as a rule, there are various microorganisms (some types of staphylococci, streptococci, etc.), whose activity is controlled by the local immunity of the host organism. When local immunity is weakened, inflammatory processes are triggered and develop: acute rhinitis, the respiratory function of the body is disturbed, and changes in the nasal mucosa are demonstrated. Feedback indicates activation of the immune system in an invasive animal. In the nasal mucosa increases the number of leukocytes. There are several varieties of them, with bacterial infections the main role in protecting the body is played by neutrophils, with viral - lymphocytes. Macrophages may also appear.

In case of allergy to the host organism, the metabolites secreted by the larvae of the sheep gadfly (allergen), to which the increased sensitivity of the immune system occurs, act. This reaction leads to the release of certain substances (histamine, bradykinin) in the nasal mucosa, which cause allergy symptoms. At the same time, such cells of the immune system as eosinophils are of greater importance.

When postmortem dissection of sheep, invaded by larvae of a sheep gadfly, we noted inflammatory processes in the bronchi and lungs. The most pronounced pathological changes were in sheep with a high level

of intensity of bovine invasion. The marked changes were characterized by bronchitis, accompanied by hyperemia, proliferation and desquamation of the bronchial epithelium. In some cases, dystrophy, necrosis of the epithelium of the bronchi, the absence of ciliary cilia and an increased number of goblet cells were noted. In the lumens of the bronchi, clusters of mucous masses were found with a large number of desquamated epithelial cells, lymphocytes, and eosinophils. The subepithelial layers were infiltrated with lymphoid cells. Infiltrates were found around the blood vessels, interalveolar septa adjacent to the inflamed bronchus.

Changes in the lungs were demonstrated by interstitial pneumonia, pulmonary plethora with massive or isolated hemorrhages, decreased airiness of the lungs, decreased alveolar lumen with accumulation of serous fluid in them. Marked pathological changes in the respiratory system, in our opinion, are not strictly pathognomonic during sheep estrosis.

Estrosis, apparently, should be considered from the standpoint of the complex effect of the parasitic larvae of the sheep gadfly on the host organism.

CONCLUSION

Summarizing the above data, it should be noted that in the pathogenesis of sheep estrosis, the alteration of the nasal mucosa due to mechanical action, traumatization of the mucous membrane by spikes of parasites is of essential importance. In some cases, the effects of alteration can disappear after the termination of contact between the parasite and the host. In others, with high intensity of bovine invasion, alteration is irreversible and is accompanied by the death of tissue structures, the formation of more or less extensive areas of necrosis. The disintegration of cells contributes to the release of biologically active substances: histamine, bradykinin, serotonin, proteolytic enzymes that stimulate reactive processes in an invaded body. The development of inflammation is regulated by the body's reactivity. Alteration of the mucous membrane promotes the penetration of allergens secreted by the larvae into the deep-lying layers of damaged tissues and creates the prerequisites for sensitization of the organism of an invasive animal. Part of the allergens in the airborne droplet state (with inhaled air) is introduced into the bronchi and lungs and causes changes in them that have similarities in morphological features with the hyperergic form of inflammation.

The combination of the phenomena observed during estrosis allows us to explain the often observed clinical picture of increased reactivity of the upper respiratory tract in invasive sheep. On the basis of clinical signs (nasal discharge, sneezing, paroxysmal coughing) veterinary workers quite often make erroneous diagnoses: bronchitis, pneumonia, etc. It is possible that for this reason, veterinary experts indicate rarely enough.

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