Global Veterinaria 12 (4): 487-490, 2014
ISSN 1992-6197

DOI: 10.5829/idosi.gv.2014.12.04.8359

Morphological and Histological Changes with Hoof Pathology of Akjaik Sheep Breed

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Abstract: The article deals with the histological and cytometric indicators in different stages of pathologic process development with foot rot. Hoof diseases of cattle and small cattle have been paid serious attention in recent years both in neighboring countries and in foreign countries. This is pressing problem for Kazakhstan. Distal parts of caxal and pectoral limbs of healthy sheep of Akjaik breed with lesions in different stages of disease development were used as research material. Research showed that despite a certain anatomic locality of pathologic process histological and cytometric indicators plays important role as valuable information. All mentioned indicators allow following pathogenesis of the disease in dynamics and make corrections into treatment and propylaxis. So, results of patho-morphological changes in distal part of a limb of diseased sheep prove that they may be discovered only via phased examination.

Key words: Pathology · Foot Rot · Patho-Morphology · Sheep Breeding · Distal Part Of A Limb · Small Cattle.

INTRODUCTION

Study of hoof diseases of cattle and small cattle have been paid serious attention in recent years both in neighboring countries [1- 3] and in foreign countries [4, 5]. This is pressing problem for Kazakhstan [6, 7].

Diseases of distal part of limbs require special attention because they are one of the most widely spread pathology of cattle.

Lesions of distal parts of sheep livestock are most frequent with foot rot. Foot rot is observed almost in all countries with developed sheep breeding [8]. In CIS foot rot began developing in 1950-60s and reach the highest extend in late 1970s. This disease causes great economic damage due to decrease of meat, fleece and milk productivity, burn of weak breed and untimely cull of diseased animals and reduction of immunity of mature sheep and young animals to different diseases. Foot rot causes 10-40 % reduction of fleece productivity, 20-60 % - milk productivity and 10-40 % - meat productivity. Economic damage is the most worse when disease appears in formerly safe farms when injure has mass character [9, 10].

Epizootiological specifics of foot rot, its diagnostic, treatment and prophylaxis methods are studied by the scientists in different countries in details. Still foot rot continues spreading on new territories that hamper development of sheep breeding.

However information about patho-morphic changes of soft and hard tissues of distal part of diseased limbs in different stages of pathologic process is insufficient. Study of morphological changes in different stages of disease development that may support optimal strategy of anti-epizootiologic measures are the base of this research.

MATERIALS AND METHODS

Distal parts of caxal and pectoral limbs of healthy sheep of Akjaik breed with lesions in different stages of disease development were used as research material. Samples of diseased tissues were taken from the animals with clinical manifestations if limb lesion after diagnostic laboratory research by microscopy (smear preparation immediately after material taking), inoculation of medium in forced slaughter in JSC “Izdenic” of Taskalin district of West-Kazakhstan region. The same parts of distal part of limbs of healthy sheep were taken for comparison.

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Taken pathological material was fixed in 10% solution of neutral formalin. Processing was done on automatic histological tissue processor Leika ÒÐ 1020. Histological preparations were made using sledge microtome Leika SM 2010 R (microscopic section thickness 2-5 micrometer). Preparations were rewaxed, colored with hematoxylin and eosin and placed under cover glass on workstation Leica ST 5010 Autostainer XL/CV5030 using media BiOMaent. Then they were analyzed under microscope Leica DM 1000 and Leica DMB with taking photos.

RESULTS AND DISCUSSION

Morphological picture of all preparations from healthy sheep is the same. In preparations - skin fragment with thick corneal layer. Corneal masses are represented by compact homogeneous layer tightly connected with epidermis surface. In epidermis there may be observed noticeable stratification: cells of upper levels are applante with elongated stroke-view thickly colored cores, epidermical cells of inner layers are oval or polygonal with fine-grained cytoplasm and rounded cores. Basal layer cells have rounded thickly colored basophilic cores encircled with thin rim of cytoplasma. Basal membrane is uniformly apparent in all fields of vision. Derma papilla are well shaped, lie in upper layers of derma on the same depth. In upper and deep layers of derma there is venous and capillary plethora. Derma base is represented by coiled connective tissue fibers clustered in compact bunches oriented in parallel with skin. Majority of cells are matured fibroblasts and fibrocytes and histocytes (Fig. 1, 2).

In preparation there is skin fragment with thick corneal layer. In deep layers of derma like in the case of histopreparation with lesion of deep layers necrosis nidus is observed represented by unstructured fine-grained masses with basophilic tint. Perifocal demarcative barrage comparing with further histopreparation with deep layers lesion is almost invisible and young granulation tissue is characterized by more matured character. Major cells are young fibroblasts, a number of neutrophils and macrophage significantly reduced comparing with histopreparation with advanced stage. Neogenic connective tissue fibers are partly chaotic and partly clustered in compact bunches oriented round the necrosis nidus. Among young neogenic vasculars there is a small number of vascular with differentiated walls and endothelial lining. Patho-morphologic picture in epidermis is alike the picture of histopreparation with lesion of deep layers (Figure 3, 4).

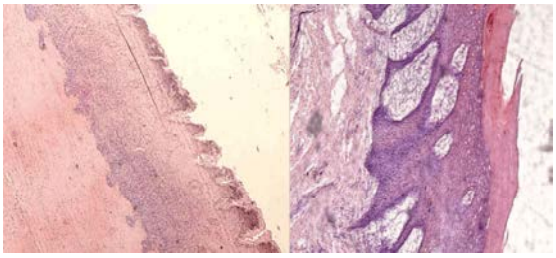

Fig. 1: Distal part of limb of healthy sheep (hematoxylin and eosin coloring).

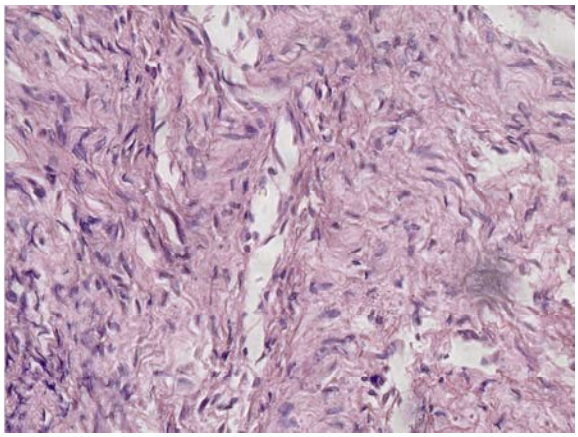

Fig. 2: Distal part of limb of healthy sheep: (hematoxylin and eosin coloring).

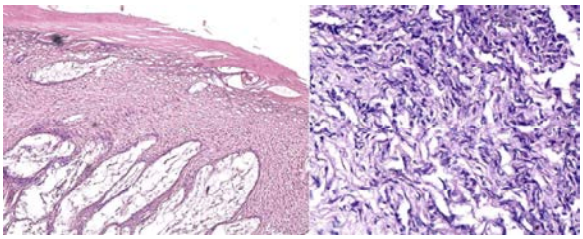

Fig. 3: Distal part of limb of diseased sheep, starting stage: (hematoxylin and eosin coloring

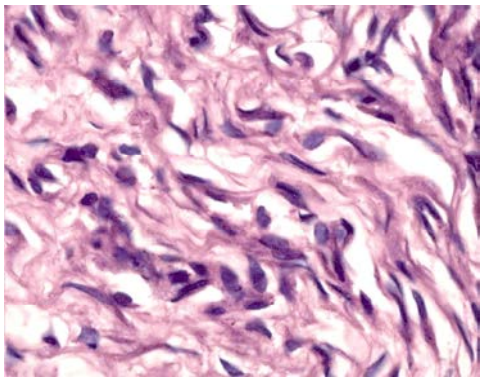

Fig. 4: Distal part of limb of diseased sheep, starting stage: (hematoxylin and eosin coloring).

In preparation there is skin fragment with thick corneal layer. In deep layers of derma necrosis nidus is observed represented with unstructured fine-grained masses with basophilic tint. Necrosis nidus is encircled with thick cell barrage that consists mainly of neutrophil leucocytes and cells of lymphoid line with small diffusely scattered niduses of macrophage infiltration in this background. Between demarcative inflammatory infiltration and residual derma tissue processes of proliferation of young granulation tissue may be observed. It is rich with cell elements and has small number of neogenic connective tissue fibers and small vascular. Major cells are adolescent fibroblasts, among them there are observed small diffusely scattered nidus of infiltration with neutrophils, lymphocyts and macrophages. Neogenic connective tissue fibers are thin chaotically scattered among cells masses. Numerous young small vascular may be seen on this background both as cell-less slots and vascular buds. Openings of neogenic vascular are filled with erythrocyte. In hypoderm there is venous and capillary plethora with erythrostasis and plasmatic impregnation of vascular walls. Corneal layer is loosened, partly desquamated. In epidermic layer - apparent acanthosis. Epidermacytis in the state of severe protein dystrophy many cells have clear vacuolated cytoplasm. Sweat-gland ducts are gangliacly dilated and filled with layers of desquamated epithelium (Figure 5, 6, 7).

Epidermis of diseased sheep was in average 472,9 (±104,82) micrometer, of healthy sheep - 427,7 (±53,83) micrometer. In places of thinning of epidermis thickness may be 328 micrometer for diseased sheep and 296 micrometer for healthy sheep. In places where epidermis is thickened its thickness may reach 616 micrometer for diseased sheep and 473 micrometer for healthy sheep. Comparative characteristics of epidermis thickness are presented as diagram (Figure 8).

Linear analysis of epidermis thickness shows that there are two generations for diseased sheep that indicates places of thinning that are alternate with thickening that is apparent in severe stage and right-side generation is apparent. For healthy sheep comparing with diseased sheep only apparent right-side generation is defined.

Average derma papilla depth (micrometer) regarding basal membrane for diseased sheep is 234,24 (±122,8) micrometer, for healthy sheep 185,6 (±40,25) micrometer. In places of thinning of derma papilla the depth for diseased sheep may be 78,4 micrometer and for healthy

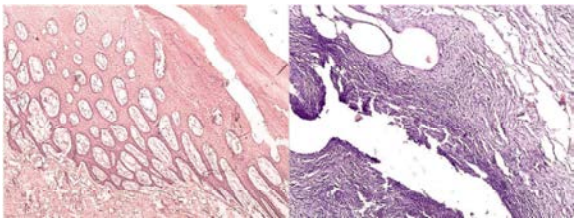

Fig. 5: Distal part of limb of diseased sheep, severe stage: (hematoxylin and eosin coloring).

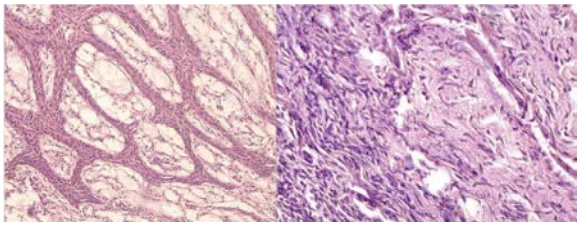

Fig. 6: Distal part of limb of diseased sheep, severe stage: (hematoxylin and eosin coloring).

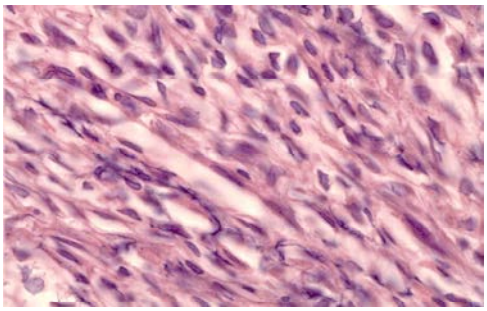

Fig. 7: Distal part of limb of diseased sheep, severe stage: (hematoxylin and eosin coloring).

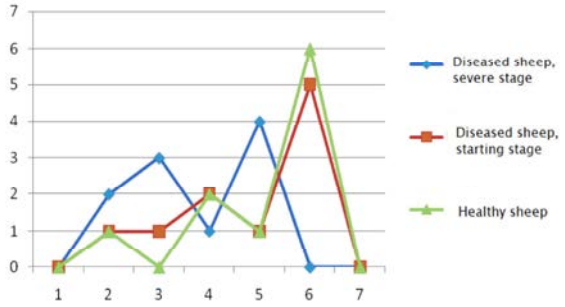

Fig. 8: Epidermis thickness (micrometer) of distal part of sheep limb

123 micrometer. In places where derma is thickened it is 377 micrometer thick for diseased sheep and 236 micrometer thick for healthy sheep (Figure 9).

Linear analysis of derma papilla depth show that there are two generations for diseased sheep that indicates places of thinning that are alternate with

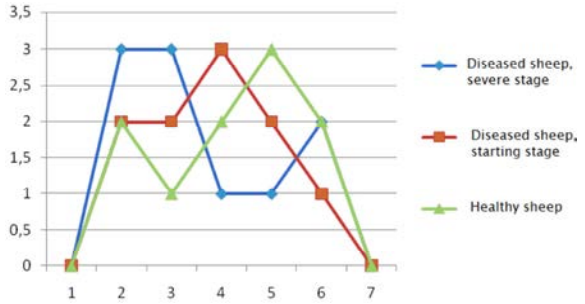

Fig. 9: Derma papilla depth (micrometer) regarding basal membrane of distal part of sheep limb

thickening that is apparent in severe stage and left-side generation is apparent. For healthy sheep comparing with diseased sheep only apparent right-side generation is defined.

CONCLUSION

General changes in distal part are in correspondence with the data of the other researchers and phased research of distal part of sheep limb is done for the first time.

In severe stage histological changes in distal part of diseased sheep limb are characterized by lymphoid and macrophage reactions, vascular changes, progressive changes in microcirculation race, vascular plethora, eryphrostasis and edema and by apparent acanthosis in epidermis.

Average epidermis thickness for diseased sheep was 472,9 (±104,82) micrometer, epidermis thickening up to 616 micrometer, derma papilla depth regarding basal membrane 234,24 (±122,8) micrometer, depth thinning up to 78,4 micrometer and some thickening of derma up to 377 micrometer.

So results of patho-morpholoical changes in distal part of limb of diseased sheep may be discovered only via phased survey.

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