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Experiments in Transmission of Theileriasis and Anaplasmosis of Sheep through Ticks *Ornithodoros lahorensis* and *Haemaphysalis sulcata*

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DEPARTMENT OF MEDICAL ZOOLOGY
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P. A. Bitukov (1953) Experiments in transmission of theileriasis and anaplasmosis of sheep through ticks Ornithodoros lahorensis and Haemaphysalis sulcata. Trud. Akad. Nauk. Kazakhskoi SSR, Inst. Zool., 1:30-36. (From the Veterinary Institute, Kazfiliala Vashnil).

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In conducting inspection of sheep on haemosporidiosis in some districts of South-Kazakhstankoi region, we repeatedly observed theileriasis and anaplasmosis of sheep.

S.N. Kamenski (1924-1927), as a result of epizootic observations, attributed the role of vector of piroplasmosis of sheep in Northern Caucasus to the tick Rhipicephalus bursa.

N.V. Popov (1926) acknowledged the tick Rh. bursa as vector of piroplasmosis of sheep in Crimea.

E.F. Rastegaeka (1933) in a special experiment on breeding different stages of ticks Rh. bursa on sheep established that blood parasites P. ovis, Fr. ovis, B. ovis, and A. ovis are transmitted by larval and by nymphal stages of these ticks. She also established by laboratory experiments (1935) that A. ovis and Th. recondita are transmitted by Ornithodoros lahorensis in the nymphal stage. However, N.V. Matikaschivili (1936), who conducted experiments on transmission by O. lahorensis ticks of theileriasis and anaplasmosis of sheep, received negative results.

V.I. Kurtchatov and B.D. Sokolov (1940) expressed the conjuncture that the coincidence of autumnal-winter outbreak of piroplasmosis of sheep and mass attack by larvae and nymphs of Rh. bursa permits one to suspect transmission through intermediate stages of vector.

G.S. Dzasokhov (1940) indicated that experiments made by him on transmission of haemosporidiosis by Rh. bursa in the larval stage gave negative results, but on attaching this tick in the adult stage he received positive results with piroplasmosis of sheep.

E.F. Rastegaeva (1940) established that under experimental conditions A. ovis and Th. recondita are transmitted by Dermacentor marginatus. In the same conditions, Ixodes persulcatus transmits B. ovis.

A.A. Markov (1940) conducting experiments on attaching Haemaphysalis otophila adults, obtained positive results with piroplasmosis of sheep.

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In 1940 he also obtained positive results in anaplasmosis of sheep by injecting emulsions of D. marginatus.

B.L. Sokolov (1949) indicated that Rh. bursa is the vector of haemosporidiosis of sheep (Crimea) not only in the adult stage but also in larval and nymphal stages (P. ovis, B. ovis).

From this literature data it is seen that in transmission of haemosporidiosis of sheep, the following ticks species are significant: Rh. bursa - vector of piroplasmosis, babesiosis, Francanella colchica, anaplasmosis, and theileriasis (Th. recondita) of sheep; O. lahorensis - vector of theileriasis (Th. recondita) and anaplasmosis of sheep; D. marginatus - vector of babesiosis and theileriasis (Th. recondita) of sheep. I. persulcatus - vector of babesiosis, anaplasmosis and theileriasis (Th. recondita) of sheep and H. otophila - vector of piroplasmosis of sheep.

If tick vectors of haemosporidiosis of sheep were more or less studied in Caucasus, Crimea, and other places, they are absolutely unknown in Kazakhstan. According to L.M. Tzelistcheva, in the tick fauna of Kazakhstan, the basic vector of haemosporidiosis of sheep - Rh. bursa - is absent. It was established by A.A. Markov that the tick vector of piroplasmosis of sheep, H. otophila, is not found in Kazakhstan.

In order to elucidate composition of tick species, period of their parasitism on sheep, and stages of infestation on agricultural cattle, we collected ticks from 46 agricultural farms in Southern Kazakhstan province. The ticks H. sulcata and O. lahorensis are species whose distribution and seasonal parasitism corresponds with distribution and seasonal infection of sheep by theileriasis and anaplasmosis.

The rest of the tick species collected were: B. calcaratus, ticks of genus Hyalomma and others that were parasitic at times of the year not corresponding with seasonal infection, or found in insignificant numbers.

Thus, O. lahorensis and H. sulcata were suspected as natural vectors of theileriasis and anaplasmosis of sheep. Both species parasitize animals in cold period of the year. Infection of sheep by haemosporidiosis especially in winter was noted by Markov, Dzasokhov, Nazaretski (in Crimea), Metsvetser (in Azerbaijan), Matikaschivili (in Georgia) and others.

If epizootic observations give basis to suspect and single out from general number of O. lahorensis and H. sulcata as possible vectors, then experimental tests must conclusively solve the question of the role of these or other ticks in distribution of these infections.

To verify and confirm epizootic observations, we conducted two tests (1948-49) on transmission of theileriasis and anaplasmosis of sheep. Material used for infection of experimental animals was ticks collected from sheep on farms unfavorable for theileriasis and anaplasmosis of sheep; partial collections were made from dwellings of the animals. For tests in 1948 collections were made in Postandikskom and Sari-Agachskom regions, but in 1949

Later such analyses were periodically repeated. During all the period of observations in 1948 animals were subjected to 5 microscopic analyses of peripheral blood.

Experimental animals during all the period of observations in 1949 were subjected to 17 analyses and separate animals were given even up to 20 analyses of peripheral blood. In experiments on transmission of haemosporidiosis of sheep through O. lahorensis positive results were received on four of the experimental sheep.

Sheep (sheep-fold No.20) on attachment of O. lahorensis in nymphal stage was infected with anaplasmosis.

Ram (sheep-fold No.17) and (sheep-fold No.1) on attachment of O. lahorensis in nymphal stage was infected with theileriasis.

Sheep (sheep-fold No.28) on attachment of O. lahorensis in larval stage was infected with anaplasmosis.

In experiments on transmission of haemosporidiosis of sheep through H. sulcata, positive results were also obtained on four of the experimental sheep.

Sheep (sheep-fold No.16, 12 and 11) on attachment of H. sulcata in adult stage were infected with anaplasmosis.

Sheep (sheep-fold No.18) on attachment of H. sulcata in adult stage was infected with anaplasmosis and theileriasis.

Describing clinical picture of a sheep from sheep-fold No.1 with theileriasis infected through attachment of O. lahorensis.

Sheep (sheep-fold No.1) 10.IV.1948 were attached O. lahorensis in nymphal stage. On the sixth day rising of temperature to 40,8° was noted. General condition slightly slack, appetite sluggish, sheep often lies down. Respiration (quickened) - to 40 in a minute, pulse - 84. On the seventh day enlargement of the left sub-scapular lymphatic gland was noticeable. Smears for microscopic analysis of peripheral blood were taken, results - negative.

On the eighth day on microscopic analysis of smears of peripheral blood theileria were found. Infectiousness of erythrocytes - about 2%. Number of parasites in erythrocytes - by 1.

From 19.IV. to 22.IV. temperature held in limits from 38,8° to 39,5°. General condition - without noticeable changes. 22.IV. on microscopic analysis of smears of peripheral blood theileria were found. Infectiousness of erythrocytes - 1-1,5%. On analysis of smears and puncture of the left subscapular gland Koch's rings were not found.

From 23.IV. to 28.IV. temperature held in limits from 39,3° to 40,4°.

29.IV. general condition satisfactory, appetite of the animal maintained. Subscapular lymphatic glands, especially the left, as before enlarged, and

at their palpation the animal shows agitation. On microscopic analysis of smears of peripheral blood theileria were found. Infectiousness of erythrocytes - about 1%, number of parasites in separate erythrocytes the same. On microscopic analysis of smears and puncture of subscapular lymphatic gland Koch's rings were not found.

From 29.IV. to 8.V. temperature held in limits from 38,8° to 40,6°. General condition of the animal satisfactory.

9.V. temperature 38,6° to 39,9°. Respiration - 18, pulse - 78. General condition satisfactory, appetite maintained. Conjunctiva of the eye anaemic with icteric hue. Subscapular lymphatic glands slightly enlarged nearly painless. Microscopic analysis of smears of peripheral blood positive. Infectiousness of erythrocytes - 1%.

Clinical symptoms of sheep from sheep-fold No.11 with anaplasmosis, infected through attachment of H. sulcata, were as follows:

On 20th day after attachment of H. sulcata in adult stage, rising of the temperature to 40,1° was noted. General condition slightly slack, sheep often lies down. Mucous membrane of the mouth, nose, conjunctiva of the eye - pallid with icteric hue. Respiration quickened - to 32 in a minute, pulse - 94. On microscopic analysis of smears in peripheral blood sparse anaplasma were found. Number of parasites in erythrocytes not more than one.

From 25.III. to 28.III.1949 temperature held in limits from 39,2° to 40,2°. Appetite maintained, but with noticeable drop of the animal's fatness.

From 29.III. to 2.IV. temperature held in limits from 39,5° to 40,4°. On microscopic analysis of smears of peripheral blood, anaplasma were found. Infectiousness of erythrocytes - 3,5%. From alimentary canal was noted intensification of peristalis, faeces of watery consistence of dark yellowish color.

From 3.IV. to 19.IV. temperature held in limits from 39,4° to 40,7°. General condition unchanged. Animal became emaciated. Often lies down. Mucous membrane of the mouth, nose and conjunctiva of the eyes are anaemic. Diarrhea stopped. Smears of blood were taken three times. Results of microscopic analysis in two cases positive, in one case negative.

From 20.IV. to 29.IV. temperature held in limits from 39,2° to 40,5°. General condition satisfactory, appetite maintained. Mucous membrane of the mouth, nose and conjunctiva of the eyes anaemic. Animal very emaciated, killed for diagnostics.

Diagnosis for theileriasis and anaplasmosis was made on the basis of clinical symptoms, results of microscopic analysis of the blood, pathologico-anatomical examination and histological analysis.

Based on the experiments conducted by us, we came to the following conclusions:

1. We established the spontaneous infection of O. lahorensis in nymphal stage by theileria and anaplasma and in larval stage by anaplasma, but H. sulcata in adult stage by anaplasma and theileria.

2. O. lahorensis is vector of theileriasis and anaplasmosis of sheep in larval and nymphal stage, H. sulcata is vector of anaplasmosis and theileriasis in adult stage.

3. Transmission of anaplasmosis and theileriasis of sheep through ticks H. sulcata is established by us for the first time.

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Note: Numerous other experimental data in this paper are omitted from the present translation. This report is of special interest because it establishes the role of an argasid tick as a vector of blood protozoa. Translation made and distributed by Medical Zoology Department, U. S. Naval Medical Research Unit No.3, Cairo, Egypt.