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Original Contribution

AN OUTBREAK OF MYXOMATOSIS IN RABBITS IN BULGARIA CLINICOMORPHOLOGICAL STUDIES

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ABSTRACT
Clinico-morphological and epidemiological studies have been performed following an outbreak of myxomatosis in domestic rabbits reared in 3 non-professional rabbit farms. The morbidity rate reached nearly 100% and the death rate – about 90%.
In about 20% of affected rabbits, subcutaneous oedemas involving partially or completely the rabbits' face were observed. Oedemas were also present in the region of lips, ears, the anal and genital region. In the rest of diseased animals (≈ 80%), multiple mucoid tumours were also noticed. In some rabbits, respiratory symptoms were present.
Histopathological studies and special stainings were performed for evidencing the histogenesis of observed skin lesions. Some clinical and morphological aspects of the diagnostics and differential diagnosis of infectuous myxomatosis in rabbits are discussed.

Key words: rabbits, infectious myxomatosis, clinical and morphological forms, differential diagnosis

INTRODUCTION

Myxomatosis is an infection, highly lethal for European rabbits (*Oryctolagus cuniculi*). It is characterized by subcutanoeus oedemas that discharge a mucoid secretion after incision. The lesions are observed around the body openings and the face, especially the eyelids.

The infection was observed for the first time by Sanarelli in a group of laboratory rabbits in the Institute of Hygiene, Montevideo, Uruguay in 1896 (1). In Europe, the disease was recognized in 1953 in Britain coming from France, where it had been illicitly imported in 1952 (2). The first case of myxomatosis (as a sporadic form) was reported in Bulgaria quite recently (3).

In 1927 Aragao detected viral particles in stained smears and was impressed by their resemblance to the poxvirus and the avian pox virus. Later, the virus was named *Myxoma virus* and classified in the *Leporipoxvirus* genus of the *Poxviridae* family (4).

The myxoma virus causes a trivial infection in its natural host *Sylvilagus brasiliensis* (forest rabbit, encountered in Mexico or Argentina) or *Sylvilagus bachmani* (brush rabbit, encountered in California). In the European rabbit (*Oryctolagus cuniculi*) the myxoma virus produces a severe and life-threatening disease (2). During the 50-ties of the last century, the virus was used in France and Australia for controlling rabbit populations that endangered agricultural crops. In Australia, for instance, rabbit populations were diminished from 600 millions to less than 100 millions (5). This was, however, followed by appearance of genetic resistance (6). There are several myxomatous viral strains with higher or lower virulence. The Standard Laboratory (Moses) strain produces relatively flat skin lesions contrary to protuberant ones caused by the Lausanne strain (4). Some variants are associated with fever and insignificant skin lesions but provoke a massive pulmonary oedema.

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In field conditions, the myxomatosis is spread via insect vectors, especially fleas and mosquitoes (7, 8). The disease could also be transmitted by direct contact between rabbits (9). The virus persists in rearing cages contaminated with discharges from the lesions of affected animals and thus, non-vaccinated rabbits inhabiting them could be infected (2).

The outbreaks and the epidemiological features of myxomatosis depend on the life cycle of insect vectors. In many parts of the world, mosquitoes are the principal vector. In countries where mosquitoes participate in the transmission of myxomatosis, the disease spreads quickly and is encountered in domestic rabbits reared in cages. The variations in the epidemiology are attributed to differences in the life cycle of insect vectors (10). In Britain, the principal insect vector is the European rabbit flea *Spilopsyllus cuniculi* rather than mosquitoes *Aedes* and *Anopheles*. When a host is lacking, the flea could maintain the infection during the winter and to serve as reservoir of the infection during next summer. The temperature of the environment also influences the death rate, the lethality being higher at low temperatures (2, 11).

The pathogenesis of myxomatosis follows the model of other poxviral infections. The replication of the virus takes place at the site of inoculation and the regional lymph nodes. Then, a cell-associated viraemia and generalized infection follow (4).

The aim of the report is to present the results of clinical and morphological studies in spontaneous myxomatosis with regard to its diagnostics and differential diagnostics.

MATERIAL AND METHODS

Clinical, morphological and epidemiological studies were performed following an outbreak of myxomatosis in domestic rabbits reared in 3 non-professional rabbit farms. Specimens for histopathological studies (5 from each farm) were obtained from skin lesions of affected rabbit's post-mortem after necropsy. The materials were fixed in 10% neutral formaldehyde and embedded in paraffin. The cross-sections were stained with hematoxylin & eosin (H/E), Azan modified Heidenhains (A/H) and Shiff reactive.

RESULTS

The affected rabbit farms were situated in the same region of the country. The different farms consisted of mixed-breed rabbits with 8, 12 or 15 does and their offsprings (a total of 286 animals). In all farms, the disease was manifested in both genders in rabbits at the age of 6 months and older. The morbidity rate in this age group reached about 100% and the mortality rate was about 90%. The first affected animals were detected in the beginning of July whereas the last cases – in October. Afterwards, no cases of myxomatosis were observed in those farms. According to the season, the region was characterized with infestation of mosquitoes.

The clinical signs started with reddening of the skin of the nose, eyelids and eye sclera. Three to four days later, in some rabbits (≈ 20%) subcutaneous oedemas appeared on those sites, involving partially or completely the face of the animal. Oedemas were also found out in the region of lips, ears, the anal region and the genitals. Simultaneously, a serous and sero-purulent conjunctivitis manifested by profuse exudation from the medial eye corners appeared.

About a week after the appearance of the first clinical symptoms, the clinical picture in the other rabbits (≈ 80%) was further accompanied by appearance of multiple mucoid tumours. They were localized mainly in the region of the head (≈ 70%) – eyelids, lips, face and ears **(Fig. 1 and 2).** Other growths (≈ 30%) emerged in the region of limbs, the anal region and the genitals **(Fig. 3 and 4).** Macroscopically the tumours appear as dense, static growths. Their diameters ranged from 0.5 to 1–1.5 cm. Sometimes, conglomerates were formed among them, generally, after persisting for about 2 weeks; the tumours underwent a necrosis and were replaced by crusts. After their falling off, a cicatrix and hairless skin area appeared. At the same time, in several rabbits respiratory symptoms were observed – wheezes and catarrhal rhinitis. All animals were lethargic. Anorexia, dehydratation and emaciation to cachexia resulting in a lethal issue were present. In animals that survived (≈ 10%), the symptoms resolved after nearly 1 month period of recovery.

Fig. 1. Necrosis of tumour lesions and appearance of crusty scabs on the upper eyelid occasionally resulting in complete eye closure and blindness – anterior view.

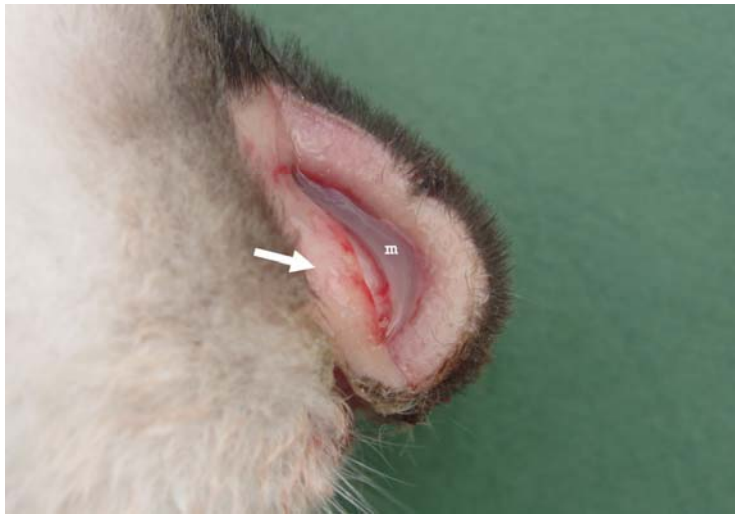

Fig. 2. Sagital section of a facial mucoid tumour (arrow). The central part was filled with mucoid material (m).

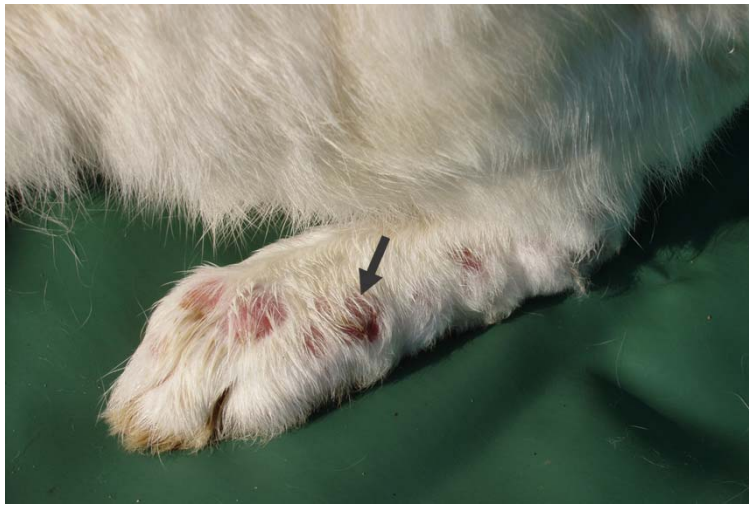

Fig. 3. Mucoid tumours proliferating beyond the skin surface in the region of limbs.

Fig. 4. Mucoid tumours in the anogenital region

Histologically, the parenchyma of studied mucoid tumours consisted of large, star-shaped, sometimes fusiform cells, anastomosing via their branched cytoplasmic processes, surrounded by mucinous substance. The mucinous matrix was traversed by delicate reticular fibres **(Fig. 5 and 6).** The parenchymal mass was responsible for the colourings, characteristic for the mucoid connective tissue.

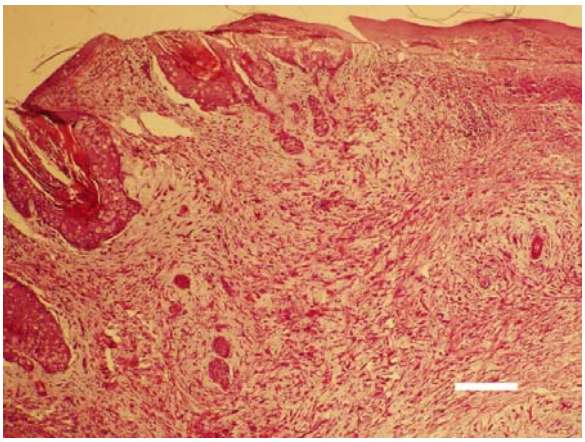

Fig. 5. Histological structure of a mucoid tumour, H/E, bar = 3 μm

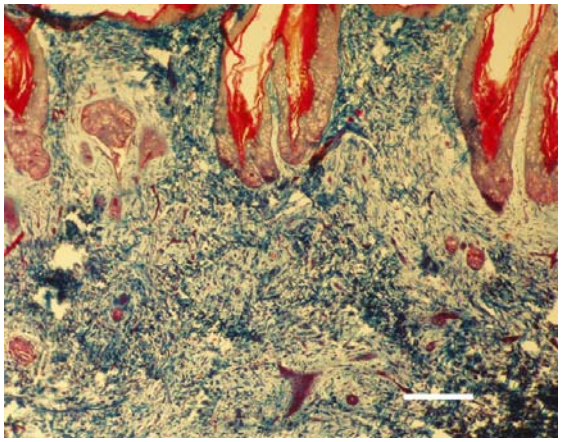

Fig. 6. Characteristic blue staining of mucoid connective tissue with Azan, modified Heidenhains, bar = 4 μm

DISCUSSION

The clinical and morphological features, observed by us, correlate to those described by bulgarian (3) and other authors from countries, where the disease has been observed much earlier (2, 5, 12). In our opinion, the typical oedemas located in the facial and the anogenital regions are distinctive symptoms allowing to diagnose myxomatosis. In a differential diagnostical aspect, the pasteurellosis and staphylococcosis should also be considered. In pasteurellosis, confined or diffuse subcutaneous oedemas (phlegmones) in cranial and cervical regions are possible, but they do not appear in the anogenital region (13 - 15). In staphylococcosis, the abscesses are with a varying size and at different sites of the body (16 - 18). During the spontaneous opening or after incision of lesions,in pasteurellosis or staphylococcosis a thick cream-like purulent discharge is present, from where the respective etiological agent is isolated.

The development of mucoid tumours is an important sign that points to the diagnosis. The

studies in this connection show that this form is encountered in Europe and South America (2, 19). According to some investigators however, those lesions could not be called tumours owing to the profuse mucinous deposits as well as to the extensive cellular proliferation in the dermis (20). This clinical and morphological form should be differentiated from the infectuous fibromatosis in rabbits (Shope fibroma). The course of the latter is benign, without alterations in the general condition and does not affect the growth rate. It is characterized by appearance of multiple tumours – fibromas. They are localized on the face, eyelids and ears but particularly on paws and thus, impede the locomotion. The fibromas persist for no more than 10-14 months and then regressed spontaneously due to the development of antibodies in rabbits (21 - 24).

With regard to the protuberant character of the lesions, observed by us, the aetiological role of the Lausanne strain of the myxoma virus could be assumed (11).

The differential diagnosis should also take into account the rabbit syphilis (Vent disease). It is also called rabbit spirochaetosis and is cause by *Treponema cuniculi.* This is a venereal disease and is characterized with small reddish sores or blisters around the genitals. They could progress to crusts or scabs, affecting also the face and the paws. The disease could be transmitted by the doe to the offsprings (25, 26).

Myxomatosis should also be differentiated by the rabbit pox. It highly resembles the syphilis and is characterized by the appearance of crusts and scabs around the genitals, lips, eyelids that later fall and disappear following some weeks or months (27).

The time when the disease was observed harmonizes with the considerable dependence on seasons (10). In myxomatosis, the incidence of the disease is earlier (summer and autumn) whereas the infectious fibromatosis occurs in ate summer, autumn and early winter (21).

In the farms included in our study, fleas were not present, but beyond any doubt the season corresponded to the extensive reproduction of both fleas and mosquitoes. From this point of view it is hard to suggest whether fleas and mosquitoes are the principal vector unlike other regions of the world. For example, it is assumed that in Britain, the transmission is mainly realized via the European rabbit flea whereas in Australia – via mosquitoes (2).

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