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Pathological changes in organs of clinically healthy Turopolje breed hogs

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ABSTRACT

Histopathological examination of organs of four autochthonous Turopolje breed hogs kept outdoors showed changes in cardiac and skeletal muscles, liver and lungs. In all four cases cardiac muscle fibers showed homogenization and fragmentation with medium to strong perymisium activation, indicating the chronic nature of dystrophic changes, as well as an attempt of tissue reparation. Between individual muscle bundles an empty space was noticed, indicating transudation from generally thickened blood vessel walls. This state can be described as edema, except for the similar, but reticulated spaces in two cases, which were described as fat deposition in cardiac muscle. Similarly, skeleton muscle showed homogenization and fragmentation with the loss of bands of skeletal muscle, perimysium multiplication and proliferation of connective tissue fibers. Blood vessel walls in skeletal muscles grew extremely thick. In both, cardiac and skeletal muscles numerous sarcocysts of various sizes were found. Described states are of hyaline-waxy type of degeneration, with attempts of regeneration and reparation. Degenerative conditions are consequences of microelement Selenium and vitamin E deficiency. Described changes in cardiac muscle are described as cardiopathy, which together with the changes on skeletal muscle could be described as systemic myopathy. Lungs of two animals showed chronic hyperplastic bronchitis, peribronchitis and emphysema, together with some areas of lung atelectasis. In both cases the parasite sections were noticed. In two cases liver showed hydropic vacuolar changes in hepatocytes. In liver interstitium there were some mononuclear cell infiltrative proliferation rich in eosinophyles. In one case there was a well-defined nodular mononuclear lymphoid cell formation, with lymphoid cells of varying size, but without specific structure. That resembles lymphodenoid hyperplasia. All the changes described above indicate that Turopolje pigs kept outdoors, although clinically healthy, are under the burden of chronic dystrophic reparation and regeneration processes of possible nutritional deficiency stress, bacterial infections and parasitic invasions.
(Keywords: histopathological changes, organs, turopolje breed pigs)

INTRODUCTION

Systemic myopathies and myocardiopathies are recently recognized as one of major problems for veterinarian experts as well as stockbreeders. It is hard to point the most susceptible animal species, because all species are equally susceptible. Through

histopathological examination of organs of Turopolje breed hogs we have to accept the fact that myopathies and myocardiopathies are not the most prominent problems just in intensive stock production. In literature data selenium and E vitamin deficiency are stressed as etiological factors for mentioned myopathies. Acid and washed out terrains, especially those rich in sulphuric unions and intensively fertilized especially with nitrogenous fertilizers, are poor in selenium and it is in a form difficult for plants to resorbe. *Schwartz* and *Foltz* (1957) have proved that selenium can prevent liver necrosis in rats and exudative diathesis in chicks. In that time it was already established that liver necrosis and exudative diathesis could be prevented with vitamin E. Based on those facts a question araised weather the organisms need additional selenium when adequate quantities of vitamin E are available. *Thompson* and *Scott* (1968 and 1970) gave the answer through examination of pancreatic necrosis in chicks. Namely, additional E vitamin did not, but addition of selenium improved the health status in animals. *Katić et al.* (1967) reported on dystrophy in year old lambs, stressing that the reason is not completely established, although pointing on many proofs that vitamin E and selenium have the most important etiological role. Also, they reported that blood levels of vitamin E in domestic animals depend on species and food. According to *Forenbacher* (1984) myopathies in domestic animals are result of constituent dispositions, especially carbohydrate diet, stress and tocoferol and selenium deficiency. Researches from *Patterson* and *Allen* (1972) are interesting. They investigated organic compositions in muscles of pathologically changed and healthy pig quarters. In their investigations no significant differences were found, so for the "syndrome of asymmetric hind quarters" in their opinion, the etiology lies in unilateral under nutrition, which is probably caused by poor vascularisation. For thickening of blood vessels *Grand* (1961) and *Van Vleet et al.* (1976) pointed that pathological processes take place in capillaries of smaller blood vessels of heart, skin, skeletal musculature, colon, stomach etc. They noticed that PAS positive material is accumulated in endothelium and subendothelially, which causes thickening of blood vessels with complete or incomplete occlusion of lumen. *Reetz* and *Bergmann* (1984) reported interesting findings. They examined heart muscles of 132 pigs approximately 120 kg weighted, 50 pigs were slaughtered as healthy, 50 were slaughtered because of circulatory collapse during transportation and 30 died during transportation. In 50% of animals swelling of intima and media of blood vessels were found and in all animals muscular elastic thickening of intima was established. According to *Grabarević* (1986) etiology of dystrophic-reparatory processes in heart and skeletal muscles is multicausal, although major cause is E vitamin and selenium deficiency. *Čuljak* (2001) stated that excessive amounts of protein in meals represent a burden for liver and other organs in processes of detoxication of ammonia and other metabolical products. Liver is central laboratory of organism with more than 3000 enzymes and 100 functions. Real proteins in pigs meal are composed of 20 ammino acids, which are divided as essential, semi essential and non-essential, and deficiency causes problems in digestion, motility, skin and hair changes, decreased immune response and failure of other functions. Along with ammino acid and vitamin deficiencies degenerative changes occur, primarily in liver. Besides, toxic products lead to decreased liver function and intoxications which are manifested as gastrointestinal disorders, liver and kidney dystrophies along with heart dystrophy with reflex stasis of blood in lungs and hypostatic pneumonia which is often mentioned in human medicine. Besides synthesis, liver does deposing and absolute or relative deficiencies along with stress often lead to pathological changes in liver. For example in intoxications and mikotoxicoses fat metamorphosis, bleeding and adenomatous hyperplasions take place.

Starving and stress lead to decrease of liver glycogen, which can be replaced, but differential diagnosis is hardened, since it mimics fat metamorphosis (*Čuljak*, 2001). The decrease of glycogen from musculature has even greater importance, since it cannot be replaced and animal, even if it survives, remains permanently undersized. Speaking about proteins, it has to be mentioned that their sufficiency causes basis or background for Glasser disease in pigs (Diseases of Swine, 1999).Pathological changes in lungs are without doubt ecological factors which on certain way predispose, or open the doors to living agents, which thereafter cause all pathological problems, inflammatory or reparatory-productive characters.(Diseases of Swine, 1999).

MATERIALS AND METHODS

For our investigation we used organs of Turopolje breed fattened (castrated) hogs (autochthonous Croatian breed). Hogs were kept in fenced vertical log frames in a region cca 40 km from Zagreb in so called outdoor system of biocenosis of oak wood and bot hornbeam wood in regular continental climates. Hogs were breed by means of old Croatian technology of low input of food and by use of natural resources (grass, acorns) of ecological system. Each animal was daily given additional 1-1.5 kg of corn (grain). Hogs were slaughtered at 18 months of age, with abattoir weight of 58-101 kg. On the slaughtering line samples of organs were taken (heart, muscle, liver, lungs), fixed in 10% formaline, embedded in wax and cut on microtome on 4-5 micrometers thin slides. Thereafter slides were stained with Hematoxylin-Eosine. In the cases of hydropsy and vacuolization in hepatocites Sudan III method was used to eliminate fat metamorphosis.

RESULTS AND DISCUSSION

Histopathological examination of organs revealed dystrophy of heart and skeletal musculature, particularly prominent in a form of homogenization and fragmentation of muscle fibers with perimisium activation (*Figure 1*). On certain places activation was quite prominent and indicated reversible chronic processes. Such changes were noticed in heart (*Figure 2*) and skeletal muscles (*Figure 3*). In literature data many authors mention selenium and vitamin E deficiencies as etiological factors of mentioned myopathies. Through analysis of breeding and keeping of investigated animals we could conclude that selenium and E vitamin deficiencies are causative agents, since food was delivered from fields of intensive agriculture and fertilized with nitrogenous fertilizers. Also, in investigated animals stress has main role, and prominent exhaustion of immunocompetent organs is present. *Carlsten et al.* (1994) described protective effects of tocopherol and selenium combination as well as propranolol in pigs subjected to experimental restraint stress, which significantly reduced intensity of necrosis in myocardium. In myocardial and skeletal muscles we have found blood vessels sclerosis (*Figure 4*), probably as a result of deficiency, but possibly other toxic materials. Liver (*Figure 5*) and lungs changes are partly of parasitic origin, i.e. migration of larvae and have chronic character, which is visible as interstitial pneumonia and athelectases (*Figure 6, 7*) and interstitial proliferative hepatitis. In some focuses in lungs cross sections of parasites were seen and eosinophyles were detected in liver. The case of limphadenoid hyperplasia in liver (*Figure 8*) cannot be completely explained, although it can be described as limphadenosis or stem centers expansion as a result of general anemia.

Figure 1

Hyaline waxy type of degeneration with perymissium activation in sceletal muscle

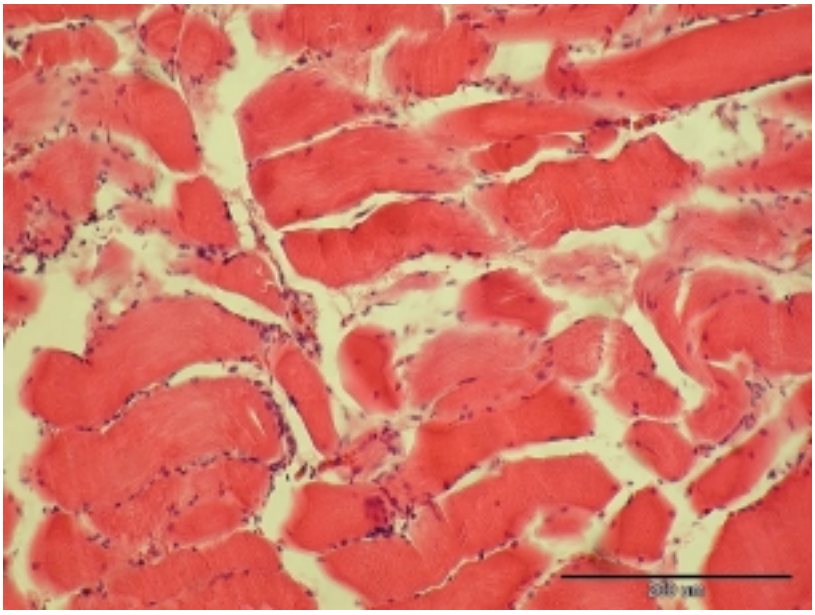


Figure 2

Sarcocysts and degeneration of cardiac muscle

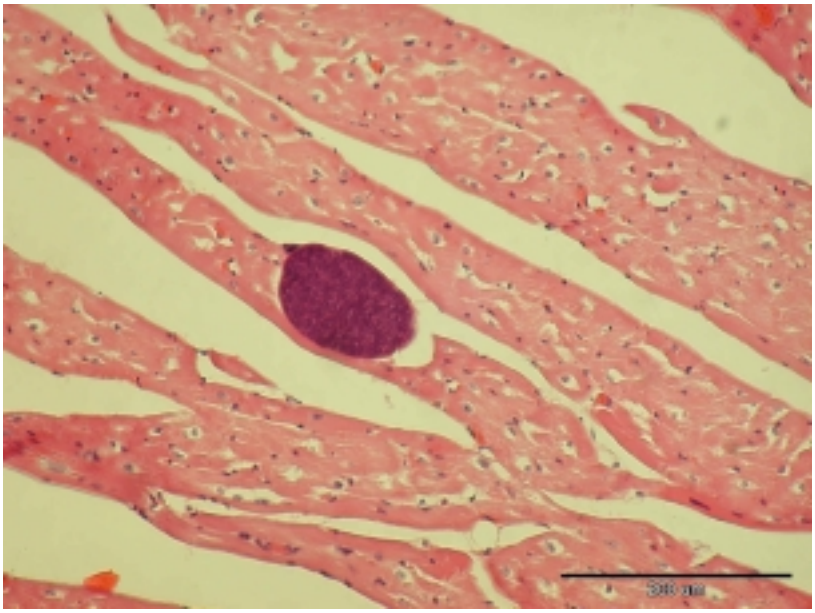


Figure 3

Sarcocysts and degeneration of sceletal muscle

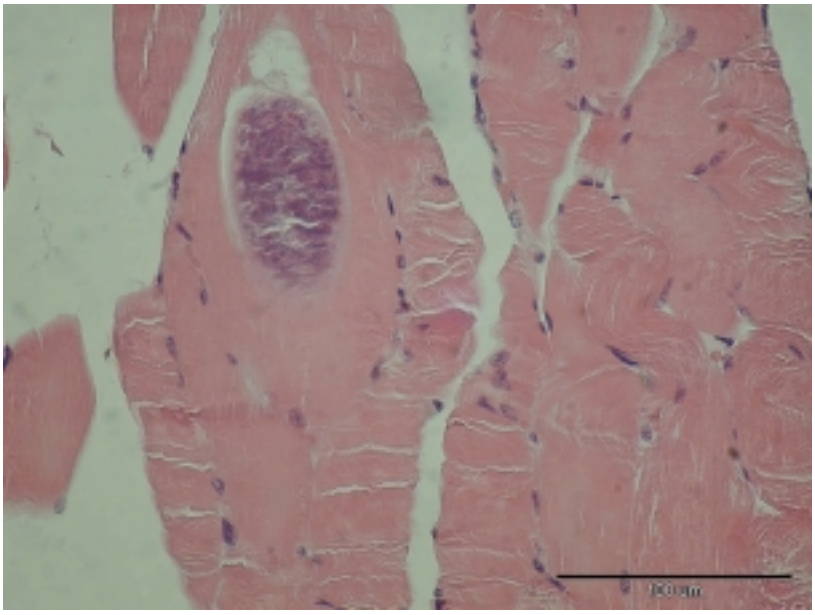


Figure 4

Fat deposition and thickening of blood wessel walls in sceletal muscle

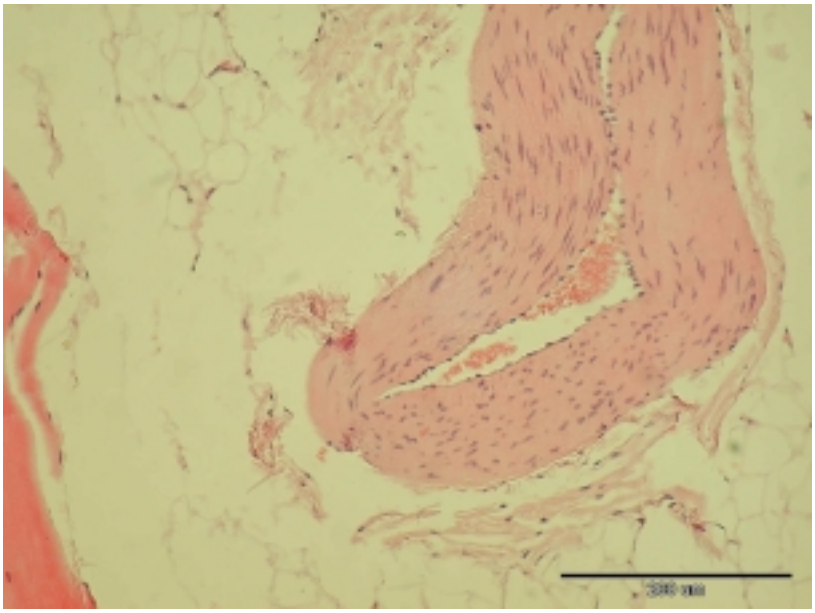


Figure 5

Hydropic and vacuolar changes and mononuclear cells proliferation in liver interstitium

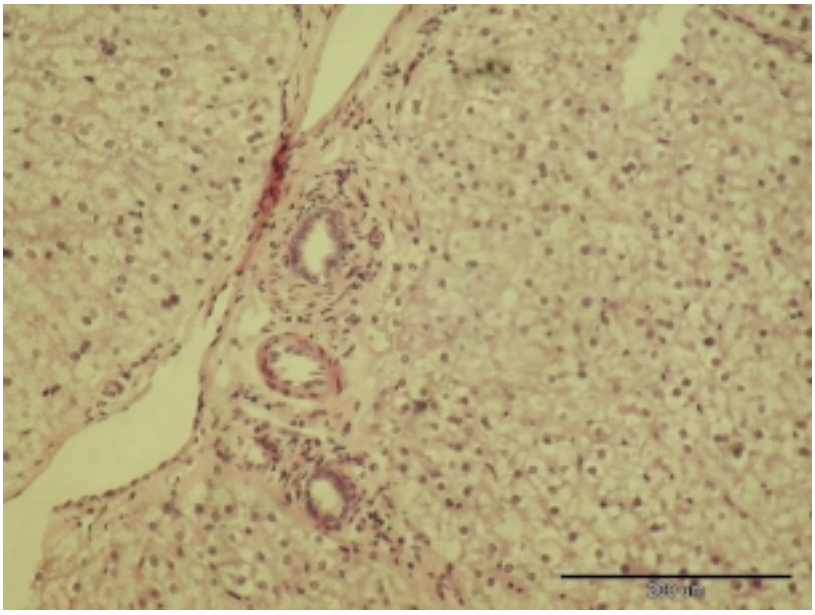


Figure 6

Parasite granuloma in lungs

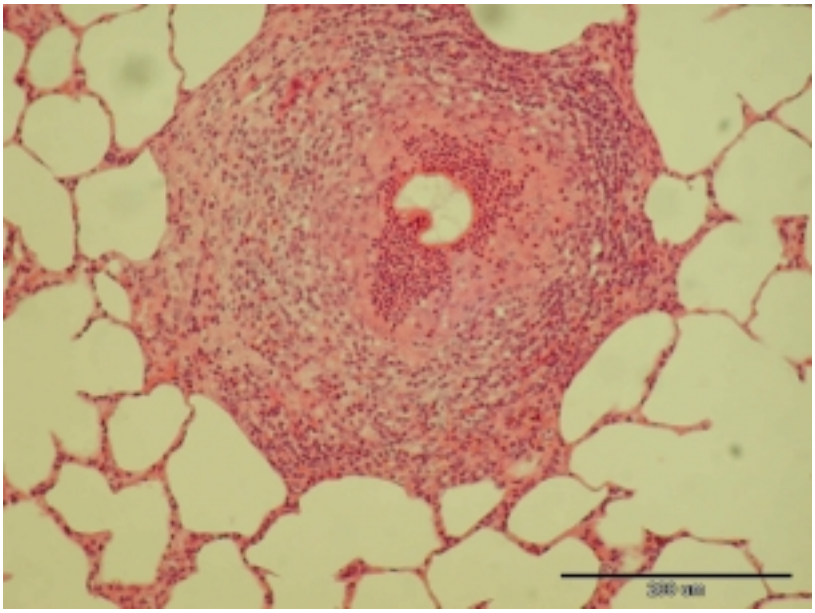


Figure 7

Cross section through two parasites and abundant eosinophile infiltration in lungs

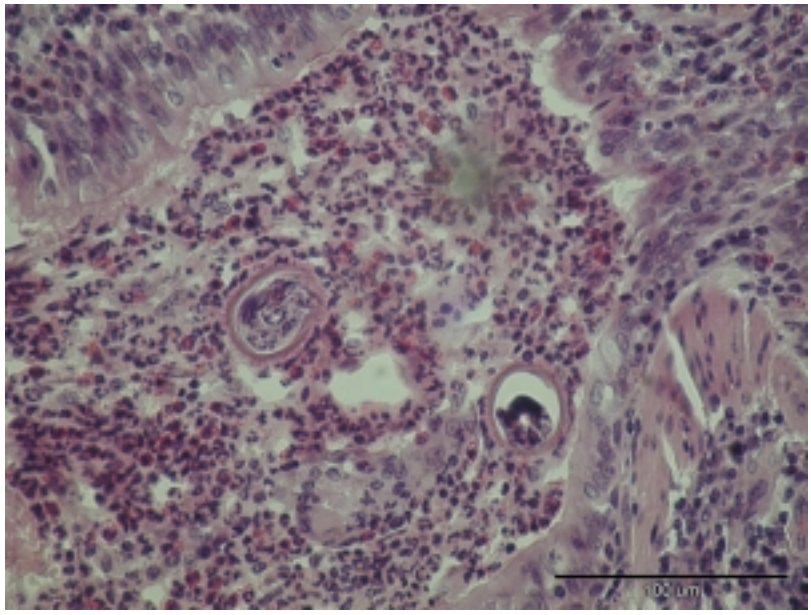
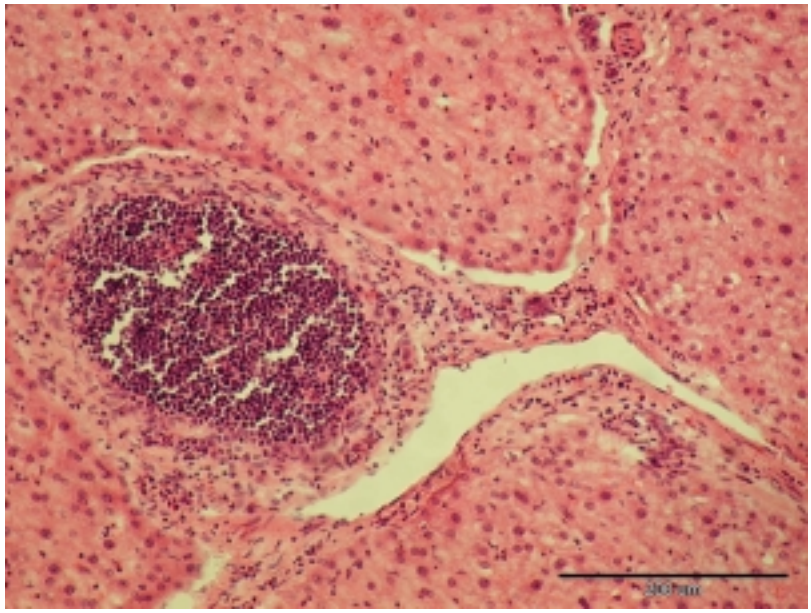


Figure 8

Lymphadenoid hyperplasia in liver



CONCLUSIONS

Based on the above mentioned facts we can conclude:

- Turopolje pigs which live in free nature are subjected to nutritive deficiencies and toxic compounds as well as pigs which are in intensive breeding
- In those pigs vitamin-mineral deficiencies are of oscillatory nature, leading to degenerative reparatory changes of chronic character
- More often than intensively bred pigs, those animals are subjected to parasitic invasions which are reflected as chronic pathological processes
- Aniparasitic therapy and vitamin-mineral supplementation are to be added (as possible) to those animals
- Also, environmental stress factors and noise should be reduced, since adaptive syndrome has often-serious consequences and leads to serious illness (decreased general resistance, infections).

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