

## THE INFLUENCE OF PARASITIC DISEASE ON IMMUNITY CELLULAR SYSTEM IN ONE HEALTH APPROACH

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### Abstract

*Wanting to study a special topic in the field of comparative oncology, the component part of the new global medical concept One Health, we proposed to develop the cytomorphological basis of adenopathies caused by the chronic parasitic infestations with Fasciola hepatica, Echinococcus granulosus or Dicrocoelium lanceolatum.*

*Our research have unfolded over 4 years, on a number of 267 animals: 82 horse, 147 sheep, 16 swine and 22 cattle, which presented, at post-mortem examination, one or more adenopathies, alongside the characteristic lesions of a chronic parasitic disease.*

*From these animals we harvested the lymph nodes with lesions and we have done smears to examine the populations of the cellular system of immunity.*

*Through this screening we succeeded to make a real "movie" of cytomorphological lesions, transposing, step by step, the transformations of lymphnodal cell populations which are persistently stimulated by the hyperantigenity induced by the chronic parasitism, from the stage of chronic lymphadenitis, to the malignant prelymphoma.*

**Key words:** adenopathies, One Health approach, parasitic zoonoses.

### INTRODUCTION

Although the *One Health* approach has, over time, been promoted in many academic organizations, scientific publications and international professional associations, at present, the trends indicate an increase of them due to unifying vision, protective to "primary prophylaxis of life" through the elaboration and implementation of policies, research programs and laws regarding the reduction of human and animal diseases, ensuring a healthy food and responsible management of natural resources (Stroud C. et al, 2016; Manlove K.R.J.G. et al., 2011; Zinsstag J. et al., 2011).

One of the major concerns of the concept, alongside of antibiotic resistance, are the zoonotic diseases that cause incalculable damage through losses of human and animal lives (Didă I.C., Duca I., 2002; Dima C. et al, 2008). This diseases are considered "high priority" for the system of diseases

surveillance, being performed numerous research, surveillance and control activities (United Nations, 2017; Pachauri R.K. et al, 2014; Kuenzli E., 2016; FAO, 2017; UNEP, 2017; Dobre G., 2016). Also, the zoonoses are the main concern of the factors involved in food safety policies for animal origin (Dima C. et al., 2008).

In present are more than 200 zoonotic diseases and it is estimated that 75% of emerging pathogens are of zoonotic origin, especially bacteria, fungi and parasites (Dima C. et al., 2008). From the data published by WHO and the UN through FAO, more than 100 zoonotic infectious agents are represented by different types of parasites (Didă I.C., Duca I., 2002). Thus, the present study complements the current measures of eradication, control and monitoring of zoonotic parasitic diseases by demonstrating that these parasites can open a path to the century illness, *the cancer*.

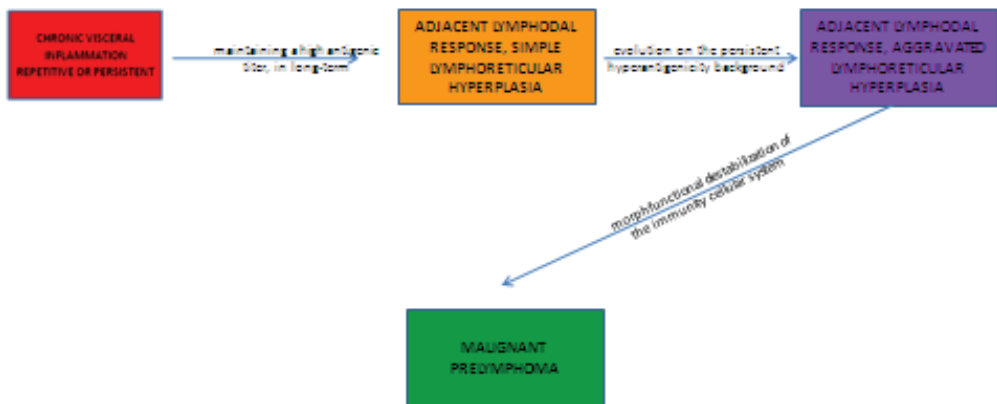
## MATERIALS AND METHODS

The presented results refer to the data obtained on 267 slaughtered animals, including: 82 horse, 147 sheep, 16 swine and 22 cattle. The anatomo-pathological examination of the animal carcasses revealed the presence of characteristic lesions of each parasitosis, respectively: (i) chronic hepatitis, hypertrophic or atrophic hepatic cirrhosis - to the sheep fasciolosis; (ii) chronic bronchopneumonia and/or chronic hepatitis - to the swine and the bovine echinococcosis; (iii) chronic hepatitis and cholangitis – to the cattle dicroceliosis. Along to the visceral lesions, we have detected, in adjacent or satellite lymph nodes, changes in

macroscopic (i) highlighted color, (ii) consistency or (iii) volume, that could be considered to represent the "key" of our hypothesis. From these lymph nodes, there were made smears by uniformly stretching of the lymph nodal "juice" and their staining using the May-Grunwald Giemsa (MGG) technique.

## RESULTS AND DISCUSSIONS

The examination of the smears gave us the possibility to confirm the evolutionary transformation stages of the lymph nodes cell populations as a result of the persistent hyperantigenicity induced by the chronic parasitosis (Scheme 1).



Scheme 1. The stages of transformation from persistent chronic lymphadenitis to malignant lymphoma

Thus, we have succeeded to achieve a true "movie" from chronic parasitic lymphadenitis, going on with simple lymphoreticular hyperplasia, then, with aggravated lymphoreticular hyperplasia and, finally, with malignant pre-lymphoma. In the animal series, the quantitative and qualitative values of lymphonodal cellularity are relatively similar in the "quasi" normality status being dominated by the combination of antigenically exposed lymphocytes, together with virgin lymphocytes (Figure 1).

The chronic inflammation can take three forms, depending on the species, respectively: (i) the dominance of the virgin lymphocyte population; (ii) the dominance of the antigenically exposed lymphocyte population; (iii) the presence, in equal relative numbers, of

both the virgin and antigenically exposed lymphocytes (Figure 2).

Simple lymphoreticular hyperplasia is characterized by the dominant presence of antigenically exposed lymphocytes together with the reticular, dendritic, histiocytic and lymphoblastic cells, without cell atypia (Figure 3).

The cellularity of the aggravated lymphoreticular hyperplasia varies depending the anatomical area of lymph node which is involved in the immune process. Thus, we found 3 distinct morphocytological forms in which was predominant one of cellular form: (i) lymphoblastic, (ii) histio-macrophage-dendritic or (iii) reticular. The cells atypia are not present and the number of blast cells is less than 20% (Figure 4).

The status of malignant pre-lymphoma also takes one of the three forms of previous status, the difference consisting of the increased number of blast cells, up to 40% and appearance of the cells atypia (Figure 5, Figure 6).

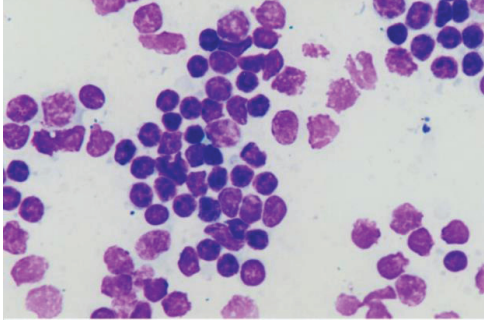


Figure 1. Sheep lymph node, "quasi" normality status, combination of antigenically exposed lymphocytes and virgin lymphocytes. MGG X 1000

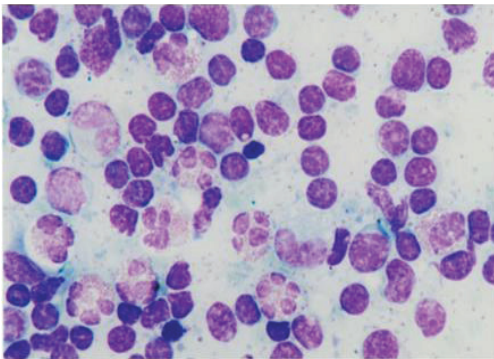


Figure 2. Sheep lymph node, chronic lymphadenitis of parasitic origin, numerous eosinophilic granulocytes, adult lymphocytes, and rare prolymphocyte. MGG X 1000

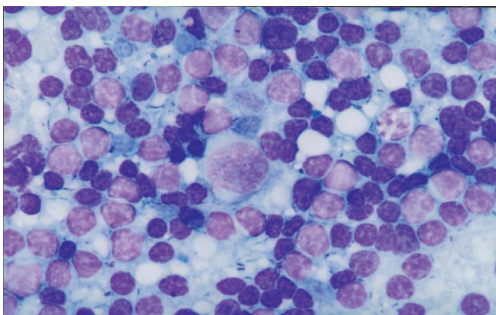


Figure 3. Swine lymph node, simple lymphoreticular hyperplasia, numerous blast cells along reticular cells and adult lymphocytes; blast coefficient is 6-7%. MGG X 1000

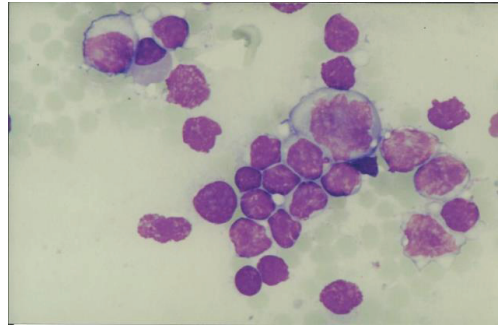


Figure 4. Bovine lymph node, aggravated lymphocytic hyperplasia, numerous lymphoblastic cells; blast coefficient is 20%. MGG X 1000

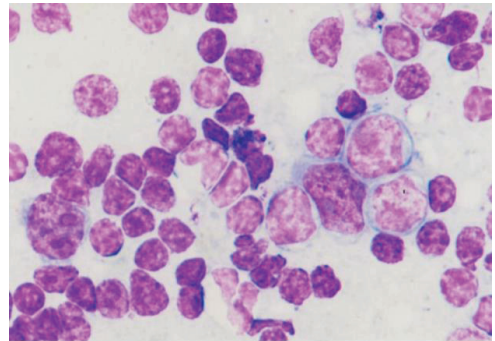


Figure 5. Sheep lymph node, the onset phase of the malignant pre-lymphoma, large number of atypical lymphopoietic series blast cells. MGG X 1000

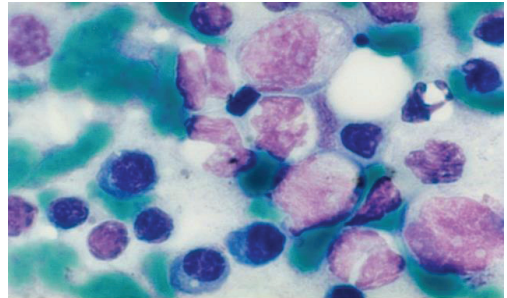


Figure 6. Horse lymph node, malignant pre-lymphoma characterized by the presence of malignant lymphoblastic cell with obvious atypia. MGG X 2000

## CONCLUSIONS

The study demonstrates that the presence of a chronic visceral inflammation - in our case, parasitic infestation, inducing a persistent hyperantigenity, may determinate irreversible changes in immune cell populations, thereby causing the development of a lymph node neoplasm.

The results bring in discussion, the capital importance of anatomopathological and laboratory examinations in slaughter house, to ensure salubrious carcasses, starting from the desideratum that man's health is inseparably linked to animal health and also, to the health of the living environment.

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