CHAPTER 5

A POSSIBLE FUNCTION OF LYMPHOCYTES IN THE FORMATION OF PROTECTIVE COVERING ENCASING PARASITES OR DAMAGED PART IN THE LIVER

Parasitic infections in vertebrate liver are quite common and due to which excessive damage to the liver cells takes place. Apparent response of liver to such focal damages is formation of a protective boundary bordering the infected or damaged part. Such a covering is usually formed of connective tissue utilizing freshly synthesized collagen.

Normally, fibroblasts are concerned with the production of collagen fibres and ultimately the connective tissue. However, fibroblasts are not found in large number in the liver but reticuloendothelial cells which are present there are known to form collagen fibres (Aterman, 1963). These reticuloendothelial cells, having definite location in the liver, may not participate in the formation of connective tissue covering demarcating the infected regions to protect the healthy parts of the liver. Formation of such protective covering necessitates the participation of some mobile cells having ability to synthesize collagen or those with capacity to become

fibroblasts which in turn would form the connective tissue. Lymphocytes, then, become the natural choice since they are known to migrate to places and transform into fibroblasts (see Elves, 1966).

For supply of such lymphocytes, generally, the lymphoid tissues viz., spleen or lymph glands become the chief source. Since the pigeon possesses lymphocytopoietic nodules in its liver (Pilo, 1967; 1970; Chapters 1 & 4), the required lymphocytes for the formation of protective covering around the damaged part could be supplied from such nodules. The interesting fact is that that almost all 'mature' lymphocytopoietic nodules in the pigeon liver possess a connective tissue covering (Chapter 1). From this fact it is supposed that the lymphocytes formed in these nodules have the capacity to form a connective tissues covering. If this supposition is true, then the lymphocytes from these modules may take part in the formation of connective tissue wherever necessary. The present study was undertaken to investigate the possible function of lymphocytes in the formation of connective tissue covering, especially that forming an encasement around the damaged cells and/or the parasites present in the liver of pigeon and some other vertebrates.

MATERIALS AND METHODS

For histological studies normal and infected livers from frogs and pigeons were collected and were fixed in Bouin's fluid. Paraffin sections of 5 μ thickness were cut and stained with Mallory's triple stain, Azan stain and Jenner-Giemsa stain (Gurr, 1956).

OBSERVATIONS AND DISCUSSION

Externally, infected liver showed white tubercles or cysts. Histological preparations of such livers revealed that in the centre of such tubercles, damaged or necrotic liver cells were present (Fig. 1) and around such damaged parts of liver of pigeon a large number of lymphocytes were found to aggregate (Fig. 2). Such accumulation of lymphocytes and macrophages around hepatic parasites in mammalian liver was reported by Dawes (1961). From the histological preparations of the infected pigeon liver, a migration of lymphocytes to the damaged area from the lymphocytopoietic nodules present in the vicinity could be perceived (Fig. 3). Amongst the aggregated lymphocytes many fibroblasts were also observed and some of which were found around collagen material as though they were secreting it (Fig. 4).

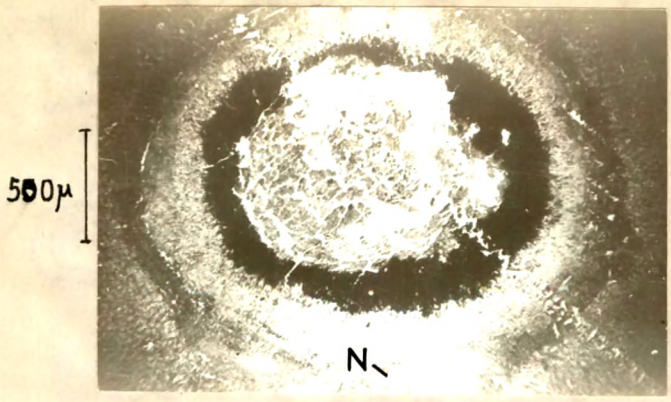
(Chapter 5: Figs. 1 to 4. Photomicrographs of the pigeon liver infected with parasites)

Fig. 1. Note the massive accumulation of lymphocytes around the infected region in the liver. A mature lymphocytopoietic nodule (N) is seen on the lower peripheral part of the photomicrograph.

Fig. 2. Higher magnification of a part of Fig. 1 (lower middle part) showing the nodule (N) near the bile canaliculi (BC).

Fig. 3. Higher magnification of a part of Fig. 2, showing the migration of lymphocytes from the nodule towards the infected region. Collagen substance is seen as a colloidal secretion (arrow).

Fig. 4. Higher magnification of a part of Fig. 3, the connective tissue formation as well as the colloidal secretion by fibroblast like cells (arrow).



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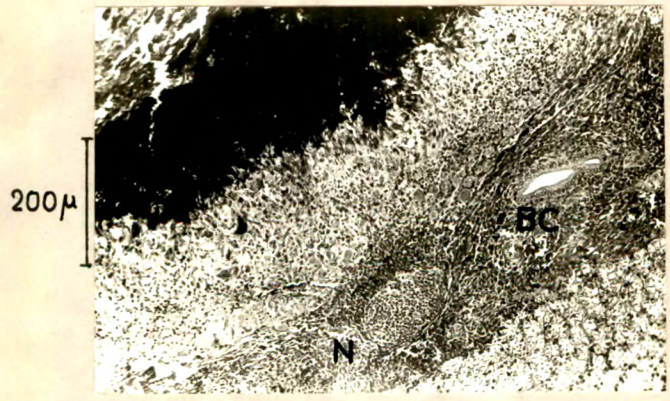

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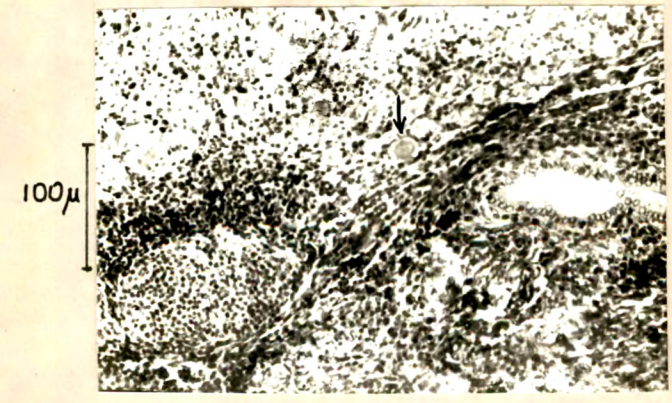

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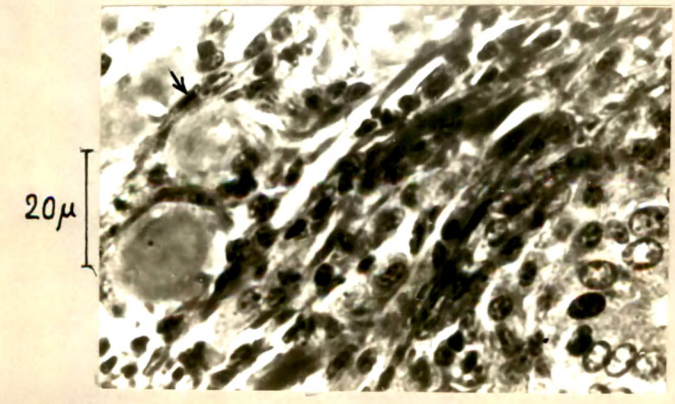

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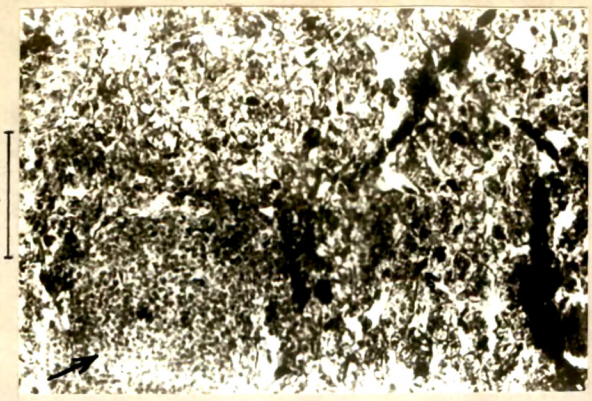
(Chapter 5: Figs. 5 to 8. Photomicrographs of the frog liver infected with parasites)

Fig. 5. A lymphoid nodule (arrow) in the normal frog liver. Note the absence of connective tissue lining around the nodule.

Fig. 6. A stage in the formation of a 'cyst' around the parasitic invasion in the frog liver. Note the absence of lymphocytes around the damaged part.

Fig. 7. An advanced stage in the formation of protective covering around the damaged part. Note the absence of a massive connective tissue formation around the infected area.

Fig. 8. Another region damaged by the parasites. Note the poorly formed connective tissue encasing the necrotic region in the frog liver.



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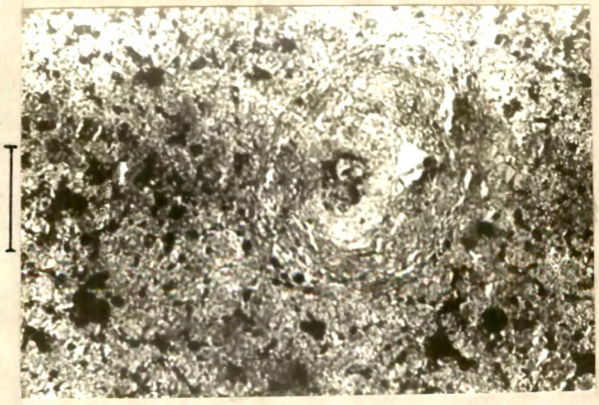

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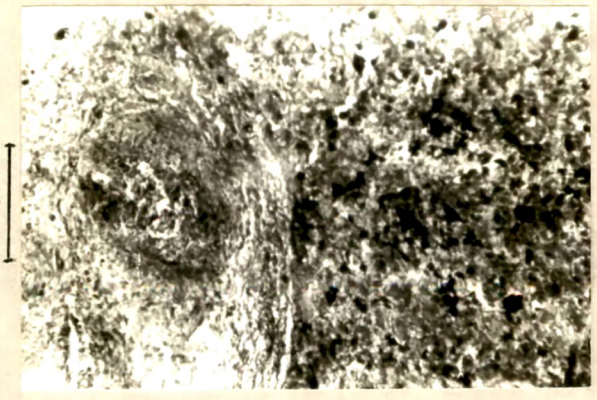

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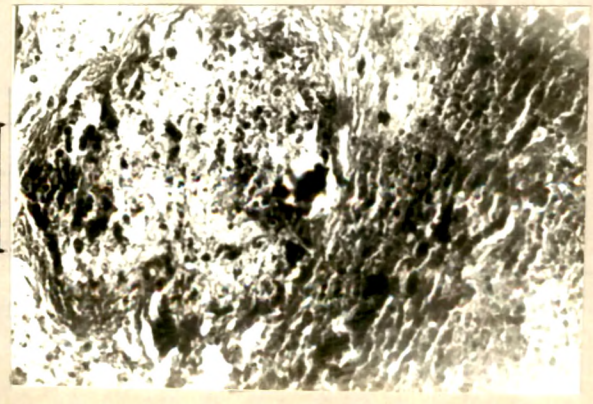

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In the pigeon liver, circumstantial evidences enable us to surmise that the lymphocytes aggregated at the infected or damaged sites are actively engaged in the formation of the connective tissue covering around the infected part, probably after they get transformed into fibroblasts. Several reports are at hand to show that lymphocytes can secrete collagen (cited in Elves, 1966).

Amongst the other vertebrates studied, only frog (Rana tigrina) possesses lymphoid nodules in its liver. However, these nodules, unlike the 'mature' ones present in the pigeon liver, lack a connective tissue covering around them (Fig. 5). Such noncapsulated lymphoid nodules are reported to be present in lymphoid follicles of certain anuran species (Baculi et al., 1970). In the wake of the facts that lymphocytes could form a connective tissue or could secrete collagen materials, it is difficult to understand as to why the lymphoid nodules producing lymphocytes in the frog liver do not have connective tissue encapsulation. It may be that the lymphocytes in the frog do not have the capacity to form the connective tissue. If this is so, one does not expect much aggregation of lymphocytes around the necrotic or infected parts in the liver of frog. This expectation becomes fact when the histological preparations of the

infected liver of frogs are viewed, wherein greater accumulation of lymphocytes was not observed around the infected regions (Figs. 6-8). However, few scattered lymphocytes were found around the area and they might be engaged in phagocytosis. A few connective tissue fibres found around the infected regions might have been formed from the existing connective tissue of the liver itself. Ramachandran and Thangavelu (1969) found that during wound healing in fish and frog, appreciable deposition of collagen did not occur and the fibroblasts present were derived from the existing connective tissue present at the wound margin.