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THE HISTIO-CAPILLARY UNIT AND ALLERGIC REACTIONS*

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The biological border between the external world and the body has its true limits in the capillaries. It is here that the various external stimuli, when they are carried by the blood stream, truly enter into contact with the body cells at the moment of crossing the vessel walls. Therefore, it is quite natural that, at the level of this boundary line, the organism should carry out its most important reaction to the abnormal stimuli which attack it within. Stimuli of physical, infectious, allergic, etc., nature cause a marked reactive polymorphism at the level of the capillaries and of the histiocytic cells of the capillary walls. This rapid and evident reactivity usually contrasts with the reaction of other parts of the tissues and, in particular, of the other histiocytes. On the basis of the consensual reactivity of the capillary and its histiocytes, we have spoken of a histio-capillary unit. Furthermore, because of the different, more marked reactivity of the capillary wall histiocytes, we have defined them as "aristocytes".

MORPHOLOGY OF THE HISTIO-CAPILLARY UNIT

The morphology of the histio-capillary unit comprises:

- 1) endocapillary protein layer; 2) endothelial membrane;

* Read before the 2nd International Congress of Allergology, Rio de Janeiro, Nov. 1955.

3) pericapillary histio-connective layer. The endocapillary protein layer is represented by plasma proteins adsorbed along the endothelial wall. The endothelial membrane is formed of endothelial cells linked together by intercellular cement elaborated by the cells themselves. The histio-connective layer comprises a cellular part and a connective one. The first morphologists attributed to these cells obscure functions of support and movement while, nowadays, modern histiological research shows them to be extremely important in the carrying out of organic and, particularly, immunizing reactivity. The cells of the capillary walls usually have a histiocytic or fibroblastic appearance and, furthermore, in certain conditions they show basophil and eosinophil granules. The granules of the mast cells contain mucopolysaccharides which take part in the formation of the fundamental connective tissue. The fundamental tissue is a fluid, amorphous material linking together the various structural elements of the connective tissue, and is a mixture of water, proteins, salts, etc. with mucopolysaccharides mainly derived from the secretion of the connective cells. The various types of polymerization of the mucopolysaccharides (particularly, hyaluronic acid and chondroitin-sulphuric acid) aid in regulating the permeability of the tissues. The histio-connective layer possesses a component of primary importance in the fundamental substance.

FUNCTION OF THE HISTIO-CAPILLARY UNIT

One of the main functions of the histio-capillary unit (carried out in the 20,000 sq. metres of its network) is the exchange of liquids from the blood to the tissues, and vice versa. It is controlled by numerous factors and special mention is made here of the condensation of the endocapillary protein layer, the integrity of the intercellular cement and the polymerization of the mucopolysaccharides of the fundamental tissue. Another important function is carried out by the histiocytes of the capillary walls, or aristocytes. Because of their close proximity with the nutritive material of the blood, these

cells are in a condition, of greater biological efficiency, shown by the greater promptness and wider extension of the reactivity. Under the most varied stimuli of physical, chemical, toxic, proteinic etc. nature, these histiocytes evolve towards widely different forms, which are here summarized.

Aristocytes (Perivascular histiocytes). Possible evolution:

- A) Scleropoietic evolution: aristo-sclerocytes (fibroblasts, fibrocytes, epitheloid cells).
- B) Phagocytic evolution: aristo-phagocytes (giant cells, macrophages).
- C) Allergo-immunizing evolution: aristo-immunocytes (lymphocytoids, monocytoids, plasmacytoids, eosinophils).
- D) Displasic evolution: aristodisplastocytes (neoplastic and leukemic cells).

The importance of the pericapillary histiocytes in immunizing processes is documented by the patterns of the experimental morphology which, under both allergenic and infective stimuli, always show proliferation of precisely these histiocytes. Various considerations lead to the hypothesis that the toxin or heterogeneous protein, on crossing the capillary wall, stimulates the histiocytes, mobilizing them for an antibody genetic function. The function of the histio-capillary unit varies according to whether the stimuli are nervous, hormonal or enzymatic.

PATHOLOGY OF THE HISTIO-CAPILLARY UNIT

Three types of fundamental alterations may be distinguished in the pathology of the histio-capillary unit: 1) hydrodynamic, 2) histiocytic, 3) biochemical. The first are related to disturbances of the permeability, and may range from oedema to hemorrhage. The proliferative histiocytic alterations may be provoked by various stimuli. Heterogeneous proteins direct the aristocytes to a defensive antibody-genetic activity. The collision between antigen and antibody, with consequent liberation of histamine, brings about a further

stimulation in the capillary area. Thus arise more irritative strains which will become as many functional and morphological alterations. Disturbances of the permeability also affect the composition of the fundamental substance which, in allergic crises, shows marked depolymerization of its polysaccharides. These alterations of the *fundamental* substance, in both allergy and so-called collagen disease, must be considered as secondary to a primitive alteration of the histio-capillary unit.

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