THE PLAQUE FORMING CELL RESPONSE IN BILHARZIASIS

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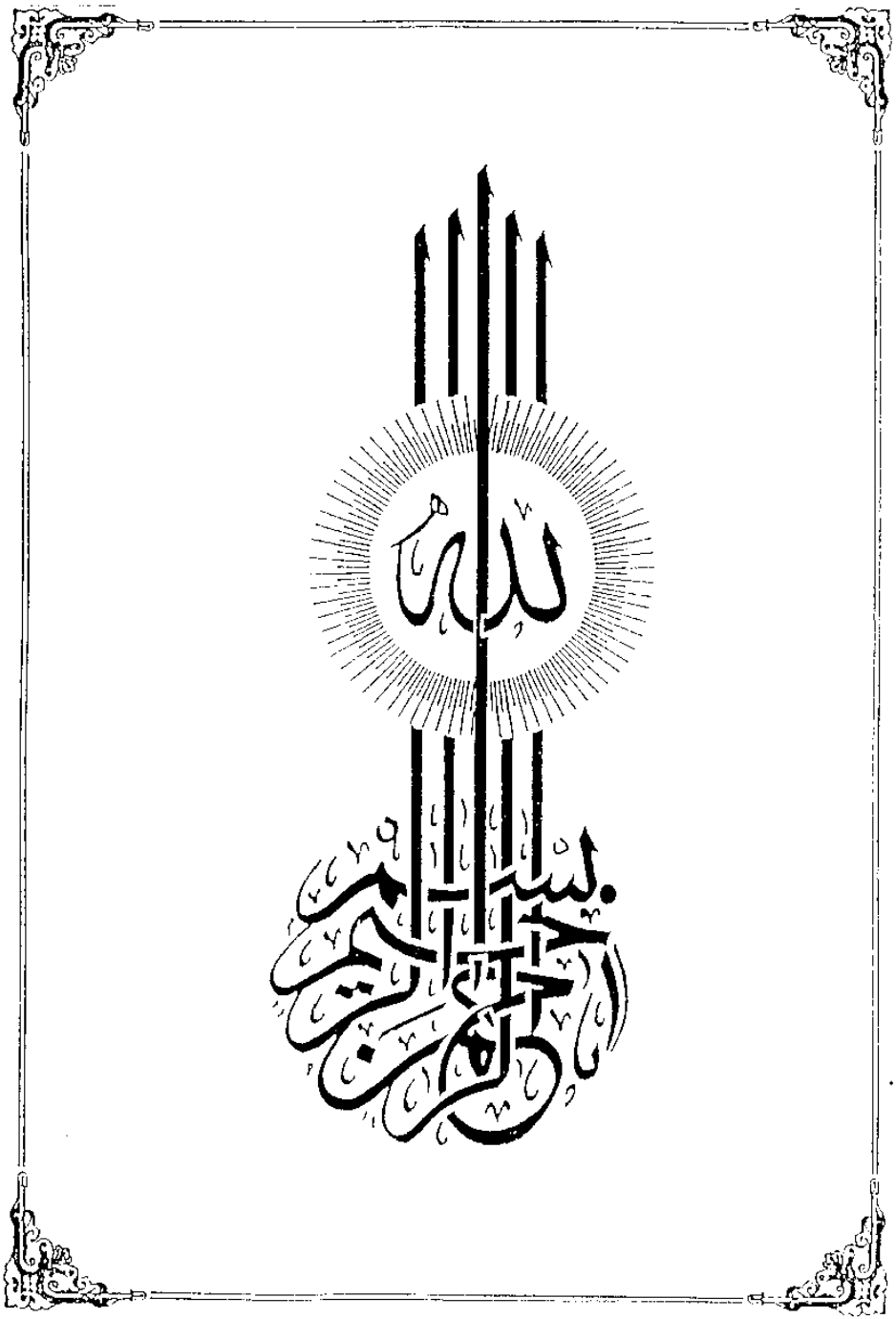

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REVIEW OF LITERATURE

The Immune Response

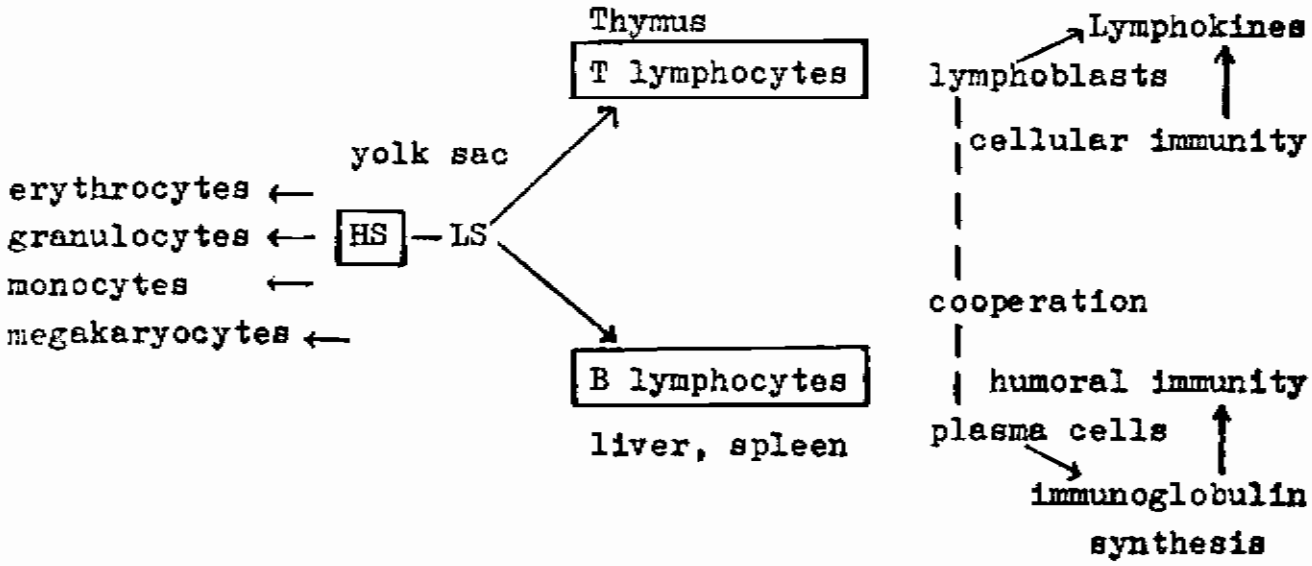
The immune response can be divided into two broad categories:-

I. The humoral immune response (antibody formation).

2. The cell mediated immune response.

Both arms of the immune response are brought about by distinct interacting cell populations, cells which can specifically recognize the antigens which are the lymphocytes, and cells which can not specifically recognize them which are the macrophages (Golub, I977).

There are two types of lymphocytes, both of them originate from one and the same cell which is the stem cell. The T lymphocytes are so named because of their close association with the thymus gland which is their site of differentiation and maturation, while the B lymphocytes are so designated because of their relation to the bursa of fabricius in chicken and the bone marrow in human (Ganong, I977).



Development of the immune system

HS: Haemopoietic stem cells.

LS: Lymphoid stem cells.

Cited from Ganong, W.F., Review of medical physiology (1977).

T Lymphocytes

They are responsible for the cell mediated immune reactions. Their functions are performed & amplified through the release of lymphokines which include: (Bowry,I979)

a. Factors affecting lymphocytes:

- Transfer factor (TF), it may transform a local response into a general one by passive transfer of specific immunological information via nucleic acid into uncommitted T lymphocytes.
- Mitogenic (blastogenic) factor (BF), it induces cell transformation in normal lymphocytes or accelerates existing reactions.
- Cell cooperative or helper factor, it increases the number of antibody forming cells in vitro and their rate of antibody production.
- Suppressor factor, it inhibits activation of B cells or their production of antibodies.

b. Factors affecting granulocytes:

- Leucocyte chemotactic factor, it causes migration of granulocytes (in vitro).

. Leucocyte inhibition factor (LIF), it inhibits migration of granulocytes.

c. Factors affecting macrophages:

. Macrophage chemotactic factor (MCF), it causes macrophages to migrate.

. Macrophage inhibition factor (MIF), it inhibits migration of normal macrophages.

. Macrophage aggregating factor, it agglutinates macrophages in suspension.

. Specific macrophage arming factor (SMAF), it arms macrophages to attack & kill specific target cells.

d. Necrotizing substance:

. Lymphotoxin (LT), it is cytotoxic for certain cultured lymphocytes eg. mouse lymphocytes, Hella cells.

e. Others:

. Proliferation inhibition factor (PIF), it inhibits proliferation of cells in culture.

. Interferon, it prevents synthesis of viral proteins in infected cells.

. Skin reactive factor, it increases capillary permeability.

Surface receptors on T cells:-

I. Theta (Θ) receptors (Reif & Allen, I964).

2. Ly-T receptors (Kisillow, I975).

3. A receptor that permits attachment of sheep red cells (Barrett, I978).

4. Few studies have identified an immunoglobulin Ig X on the surface of T cells, others have not (Unanue et al., I97I).

T cell subpopulations:-

These are characterized on the basis of expression of different LY antigen

I. T helper cells (Bowry, I979) expressing Ly I antigen. These are necessary in the initial antigen responses especially to generate Ig G & Ig M.

2. T suppressor cells (Barrett, I978) expressing Ly 2-3 antigen. They serve a homeostatic role in keeping the immune response within a tolerable level to prevent hyper-immune reactions.

3. Null cells (killer cells) (Golub, I977), these cells are both theta & Ly negative. They have a cytolytic activity against tumour cells, so they are called natural killer cells.

Role of cell mediated immunity:-

I. Immunity against intracellular organisms such as acid fast bacteria, certain viruses (rubella, varicella, herpes, cytomegalovirus), and fungi (Bowry, I979).

2. Delayed hypersensitivity reactions eg. contact dermatitis and rejection of tissue transplants (Bowry, I979).

3. Anti-tumour immunity:

Burnet was the first one to direct attention to the role of immunity in resistance to cancer when he emphasized the immune surveillance theory which postulates that the immune system constantly detects and destroys abnormal clones of cells as they arise in the body (Bowry, I979).

The main mechanism of anti-cancer immunity involves participation of cytotoxic T cells, cytotoxic antibodies working in conjunction with macrophages, B cells and natural killer cells. This is also in addition to certain lymphokines secreted by sensitized T cells like the specific macrophage arming factor, macrophage inhibition factor & lymphotoxin (Bowry, I979).

4. The production of antibodies by B lymphocytes is under

the control of two subsets of T lymphocytes, the T helper cells which help antibody formation by B lymphocytes in response to certain antigens (Roitt, I973), and the T suppressor cells which regulate antibody formation by B lymphocytes (Bowry, I979).

Tests for T cell functions:-

I. The sheep erythrocytes rosette is the one most commonly employed (Fundberg, I978).
2. Skin tests for delayed hypersensitivity (eg. tuberculin, candida & 2-4 dinitrochlorobenzene) are of value in establishing normal T cell function (Jawetz et al.,I977).
3. In the presence of certain plant derivatives such as phyto haemagglutinin (PHA), T cells will undergo proliferation. This response is termed lymphocyte transformation and is a property of normal thymocytes (Bloom,I97I).
4. Migration inhibition test is used to detect lymphokines released from sensitized lymphocytes which cause inhibition of macrophage migration (Bloom I969).

B Lymphocytes

These are concerned with the synthesis of immunoglobulins (humoral immunity) (Barrett, I978). There are five major classes of immunoglobulins which are denoted as Ig M, Ig G, Ig A, Ig D & Ig E.

Surface receptors on B cells:

1. Receptors for immunoglobulins Ig G & Ig D (Unanue et al. I97I).
2. Receptors for C_3b (complement) which is the base for EAC rosetting test (Nussenzweig, et al., I972).
3. F.C. receptor which reacts with F.C. portion of antigen antibody complexes. This receptor can be demonstrated by showing that a complex of erythrocytes and antibody E.A. will form rosette with B lymphocytes (Golub, I977).
4. Specific antigen receptors (Warner, et al., I970).

B cell functions:-

The B cell population of lymphocytes is concerned with the synthesis of immunoglobulins. On exposure to antigenic stimulation, they differentiate into plasma cell series

having a rough surfaced endoplasmic reticulum, a character of cells secreting large amounts of proteins (Roitt I973).

Immunoglobulins play a major role in protection and recovery from bacterial infections as staph., strep. etc. & some viral infections as rubella, influenza etc. (Jawetz et al., I977). On the other hand, they mediate immediate hypersensitivity reactions as asthma and antigen antibody complex disorders and diseases (auto-immune haemolytic anaemia) (Hang, I979).

Interaction of T & B lymphocytes:-

There is a lot of evidence that there are effector and helper cells in both antibody formation (Calman et al., I966) and cell mediated immune responses (Plate, I976). In both situations there are helper and effector determinants on the antigen.

Two broad classes of theories explain the nature of interaction between helper T cells & effector B cells. In one of these, T cells elaborate soluble factors which

interact with B lymphocytes (Golub, I977). The other theory is based on cell interaction, it postulates that the carrier portion of the antigen reacts with the T cells which then present the hapten portion to the B cells (Golub, I977).

Tests for B cell functions:-

I. Quantitative measurement of serum immunoglobulins is the most commonly employed test (Fundberg, I978).
2. E.A.C. rosettes (erythrocytes-amboceptor-complement) which is based on the presence of receptors for complement C_3b on the surface of B lymphocytes (St.Jerusward, et al., I972).
3. Detection of surface immunoglobulin receptors on B lymphocytes which are used as markers for their identification (Waller and Maclennan, I977).
4. Estimation of the plaque forming cell response to estimate the percentage of antibody forming cells (Jerne & Nordin, I963).