Urinary Passages:

The urinary passages conduct and store the urine formed in the kidneys and conduct it to the exterior. The calyces, pelvis, ureter and baldder have the same basic histologic structure, with walls of the ureters becoming gradually thicker near the bladder *(Junqueira and Carneiro, 1991).*

The ureters are essentially long straight excretory ducts with fairly thick muscular walls lined with transitional epithelium. The dense connective tissue in the underlying lamina propria becomes looser at sites where it approaches the adjacent layer of smooth muscle. Except at the renal pelvis, prominent longitudinal folds of the mucous membrane give the lumen of the ureter a characteristic stellate appearance *(Cormack, 1987).*

The ureter is 25 to 30cm. in length, and is situated in the posterior abdominal wall behind the peritoneum, and terminates by perforating obliquely the wall of the urinary bladder.

The lining transtional epithelium of the ureter consists to five layers, the surface cells which may be binucleate present a convex border towards lumen. The cells vary in shape from cuboidal to squamous (when organ is distended), and they show an irregular surface with indentations. In the

apical cytoplasm, fusiform vesicles limited by a membrane of identical thickness to the apical plasmalemma are present *(Ross and Reith, 1989)*.

The muscularis is thick and consists of bundles of smooth muscle fibers separated by strands of connective tissue and arranged as an inner longitudinal coat and an outer circular one. However, the layers are not clearly distinct, A third outer longitudinal or oblique layer is present at the lower end of the ureter. Here, the circularly arranged smooth muscle fibres disappear, and the two longitudinal layers become prominent and continue down to the ureteric orifice *(Leeson, et al., 1985)*.

The ureter enters into the bladder in an oblique course through its wall, forming a valve that prevents the backflow of urine. Peristaltic contractions of the smooth muscles in the wall of the ureter gently squeeze the urine toward the bladder *(Leeson, et al., 1985 and Cormack, 1987)*.

The transitional epithelium of the empty bladder is 6-8 layers of cells in thickness. The superficial cells are rounded and bulge into the lumen. These cells become only 2-3 layers in the distended bladder. These cells have a special membrane of thick plates separated by narrow bands of thinner plates that are considered to be responsible for the osmotic barrier between urine and tissue fluids.

The lamina propria is thick with a loose external submucosa. The musculosa is moderate in thickness and consists of the three layers, the middle circular layer being the most prominent and highly developed

around ureteric and uretheral orifices. The adventitia is formed of fibroelastic tissue *(Cormack, 1987. Junqueira and Carneiro, 1991).*

Urinary Schistosomiasis

Schistosoma hematobium infection or bilharziasis as it is commonly named to credit. Theodor Bilharz, a German pathologist working in Cairo, in 1852, who originally described it *(Bader, 1981).* Evidence of schistosomiasis during the early period of history was introduced only in 1910 when Sir Armund Ruffer, professor of pathology at the Cairo Medical School found calcified ova of the parasite among the straight tubules of the kideys of two Egyptian mummies from 1250-1000 B.C.

The two parasite species causing human bilharziasis in Egypt are S. hematobium and S. mansoni with the predominance of S. hematobium in the upper Egypt, low incidence of S. mansoni in the Middle Egypt, and over lapping of both species in the Nile Delta *(Scott, 1937; Weir, et al., 1952; Ayad, 1974; Tadros and Abdel-Ghani, 1974; El-Alamy and Chine, 1977, Abdel-Tawab, et al., 1979; and Doumenege, et al., 1987).*

This distribution may follow that of the snail intermediate hosts where Bulinus truncatus (the intermediate host of S. hematobium) in Egypt occurs throughout the country while Biomphelaria Alexandria (the intermediate host of S. mansoni) is common in Lower Egypt especially in northern part of Nile Delta *(Abdel-Tawab, et al., 1979).*

In 1989, the Egyptian Ministry of Health stated that bilharziasis affects over 20% of population and remains the country number one public

health problem and that the prevalence in rural areas among school children can exceed 50% *(Abdel-Tawab, et al., 1979)*.

Bilharziasis can be classified into an early active stage involving only granulomatous lesions, a chronic inactive stage characterized by sandy patches and 2 intervening stages; chronic active and late residual *(Edington, et al., 1970; Von Lichtenberg, et al., 1971; and Smith et al., 1975)*.

Gross Pathology of the Bilharzial Bladder:

Initial Lesions: These lesions represent the reaction of the host directed against egg deposition. It takes the form of a granulomatous inflammation mainly in the lamina propria. Subsequent lesions are secondary epithelial reactions in response to bilharzial granulomas in which the transitional epithelium may undergo either atrophic or proliferative changes *(Ghoniem and Ashamalla, 1981)*.

Billharzial sandy patches: The mucous membrane is thin and atrophic due to diminution of its blood supply *(Hashem, 1962 and Elwi, 1976)*.

Bilharzial ulcers: Bilharzial ulcers are usually single, classified into 2 categories:

- Active ulcers usually small in size (o.5-1cm) with a bleeding surface.
- Chronic cicatricial ulcers characterized by dense fibrosis.

Cystitis glandularis and cystica:

Cystitis glandularis appear as velvety red elevations of the epithelium while cystitis cystica appears either as tiny rounded transparent vesicles or as brown well defined structures *(Ghoniem and Ashamalla, 1981).*

Leukoplakia: In response to chronic irritation of the mucous membrane by the presence or passage of ova or vitamin A deficiency, squamous metaplasia and hyperkeratosis may occur *(Khafagy, et al., 1972).*

Histopathology of the Bilharzial Bladder:

Bilharzial Granuloma: Schistosoma hematobium ova are surrounded by several layers of large tissue histiocytes, plasma cells, lymphocytes. and foreigin body giant cells. Eosinophils accumulate at the periphery of the lesion and fibroblastic reaction surrounds the lesion which is called: "schistosomal follicle" *(Hashem, 1962).* Perioval granuloma is T-cell dependent *(Von Lichtenberg et al., 1973; Kassis et al., 1978, et al., 1982 and Cheever et al., 1985)* is intermediate in size and density. *(Von Lichtenberg et al., 1971).*

Epithelial changes:

The epithelium of the urinary bladder is commonly the seat of various metaplastic and hyperplastic changes in cases of schistosomiasis *(Ishak et al., 1967 and Khafagy et al., 1972).* These changes include.

Hyperplasia of transitional epithelium:

It is a non-neoplastic increase in the number of transitional epithelial stratification beyond the normal value of 6 layers *(El-Bolkainy, et al., 1981)*. It includes: simple transitional hyperplasia, polypoid cystitis, hyperplastic Von Brunn's nests and transitional hyperplasia with atypia (dysplasia).

Squamous metaplasia: This is the non-malignant change of transitional epithelium into squamous epithelium *(El-Bolkainy et al., 1981)*.

Columnar metaplasia: Columnar metaplasia may affect surface epithelium of Von Brunn's nests with a general incidence of 52.4% *(Khafagy et al., 1972)*.

The Immune System

The immune response can be defined as altered reactivity to a specific molecular configuration that develops following contact with it. This definition consists of ranks, the first regarding specificity and the second regarding memory production.

The immune system usually responds only to foreign molecular configuration. Thus, immune response can lead to either immunity (enhanced reactivity) or tolerance (sharply decreased reactivity) both showing specificity and memory, since we can respond to over one million antigens and appropriate response requires an extremely well co-ordinated cellular apparatus *(Kimbal, 1986)*.

Immune responses are initiated by binding of antigen to receptors (protein molecules having a shape that is complementary to the antigen) expressed on the surface of the responding Tor B lymphocytes *(Hong, 1989)*.

Lymphocytes mediate aquired immune response, which involves a first phase of induction or activation, a second phase of clonal proliferation and a final phase in which a proportion of the lymphocytes becomes effector cells and the remainder become an expanded population of memory cells able to provide secondary response *(Roitt, 1988)*.

The immune response is mediated by specific molecules called antibodies that are carried in the blood and lymph. The synthesis of antibodies occur in plasma cells, which are fully differentiated antibody-synthetizing cells, derived from B-lymphocytes. The specificity of immune response depends upon a set of lymphocytes that are differentiated in the thymus gland and hence called T-lymphocytes (thymus mediated) or T-cells. Most immune responses involve, the acitivity and interplay of both the humoral and the cell mediated branches of the immune system *(Kimbal, 1986)*.

The organs of the immune system are distributed throughout the body. They are referred to as lymphoid organs because they are concerned with growth and development of lymphocytes.

Lymphoid organs share three principal functions:

* Concentrate antigens from all parts of the body within them.

* Circulate the lymphocyte population between them so that every antigen is exposed to antigen specific lymphocytes.

* Carry the products of the immune response, the humoral response and cell mediated immunity, to the blood and tissues *(Mc Connell, 1982)*.

Peripheral lymphoid organs, are concerned with antigen-induced differentiation of resting lymphocytes which carry out an immune response and produce effector T and B cells. They include lymph nodes, spleen and gut associated lymphoid tissue *(Roitt 1991, a)*.

The Principal Cells of The Immune System:

T-Lymphocytes:

A thymic micro environment is necessary for the differentiation of T lymphocytes in all species. It appears that, precursor bone marrow cells, prothymocytes, migrate to the thymus gland where they are processed, become functionally competent and are then exported into the peripheral lymphoid compartment which includes the spleen, the lymph nodes and the blood *(Moore and Owen 1967, Owen and Ritter 1969, Owen and Raffe, 1970; and Konada, et al., 1973)*.

Moreover, profound changes in cell surface antigens accompany the various stages of T cell ontogeny *(Roitt 1991 a)*.

The ability to define cell surface antigens that appear at specific stages of T cell differentiation has allowed for the orderly dissection of T cells into subclasses. The most effective technique for identifing and

separating subpopulations of peripheral T cells are those employing specific antibodies to lymphocyte surface antigens. Thus, using such reagents, *Cantor and Boyse (1975)*, were able to show that the mouse peripheral T cell pool contains at least three separate T cell sets. These are referred to as the Ly 123 set (Lymphocyte 123), Ly 1 set and Ly 23 set and they account for 50,30 and 10% respectively of the peripheral T cell pool. Functional studies revealed that cells of the Ly 1 set are generally programmed to induce (help) other cell types to divide and/or differentiate. Thus they induce B cells to secrete antibody and stimulate monocytes, mast cells and precursors of T killer cells to participate in cell mediated immune responses. In contrast, cells of Ly 23 set are genetically programmed to kill or suppress other cells, while cells of Ly 123 set are generally programmed to pan T lymphocytes.

Functional subsets of human T cells were subsequently defined on the basis of the cell surface expression of fixed portion of the antibody molecule which coresponds to the two identical heavy poly peptide chains (Fc) receptors for either IgM (Tm cells) or IgG (Tg cells). Tm cells induced human polyclonal driven B cell differentiation in vitro, whereas Tg cells actively suppressed Ig synthesis *(Moretta L., et al., 1977)*.

These T cell surface Fc receptors were subsequently shown to be unstable *(Pichler, et al., 1978)*.

Using the technique of *Kohler and Milstein (1976)*, monoclonal antibodies reactive with a variety of human lymphocyte cell surface

differentiation antigens have been produced which enable the identification of a number of lymphocyte subsets *(Reinherz and Schlossman, 1980)*.

Three discrete stages of thymic differentiation can be defined on the basis of reactivity with monoclonal antibodies.

Stage I, early thymocyte	T_{10}	T_{10}
		T_9
Stage II, common thymocyte	T_{10}	T_6
	T_4	T_5
Stage III, Mature thymocyte	Helper	
	Suppressor	

Helper	T_{10}	$T_1 \rightarrow$ inducer $\rightarrow$	T_1	T_3
	T_3	T_4	T_4	
Suppressor	T_{10}	$T_1 \rightarrow$ C/S $\rightarrow$	T_1	T_3
	T_3	T_5	T_5	T_8

The most mature thymocyte population (stage III) gives rise to the peripheral T cell inducer and cytotoxic/suppressor (C/S) subsets.

Unlike the majority of the thymocyte which lack T_1 and T_2 antigens, all circulating peripheral T cells express T_1 and T_3 antigens.

This mature population could be further divided into distinct subsets of T cells, T_4 positive and T_5 positive subsets. T_4 antigen is expressed on approximately 60% of peripheral T cells while the T_5 antigen is present on 20% of peripheral T cells *(Reinherz, et al., 1980)*.

Functions of the T_4 subset:

* They are necessary for the production of lymphokines in response to antigen *(Mcuer, et al., 1982)*.
* Induction of B cells to proliferate and differentiate into immunoglobulin-containing cells *(Reinherz, et al., 1980, b)*.
* Induction of precursor cytotoxic T cells to become cytotoxic *(Friedman et al., 1981)*.
* Generation of suppressor T cells *(Yachie et al., 1982)*.
* It has been demonstrated that, with appropriate target cells, a subset of T_4 lymphocytes may be cytotoxic as well *(Moretta et al., 1981)*.
* Furthermore, within the T_4 positive population, cells with suppressor function have been identified *(Thomas, et al., 1981)*.

Functions of T_8 subset:

The T_8 subset contains a mature population of cells with both suppressor and cytotoxic functions.

The T_8 suppress the B cell immunoglobulin production *(Reinherz, et al., 1980, b)* and also suppress autologous T cell proliferative response to alloantigens *(Reinherz and Schlossman 1979)*.

The Activation of T cells:

Most of lymphocytes are in the resting phase, having not encountered the appropriate activating antigen for a considerable period of time. If ever the cells are small and quiescent. However, on encountering antigen on appropriate antigen presenting cells (APCs), lymphocytes with

appropriate receptors become more metabolically active as a prelude to mitosis.

The selective but transient activation of lymphocytes and their subsequent clonal expansion to provide enough cells to mount an effective immune response to a given pathogen, permits the immune system to maintain a wide repertoire of specificities within a relatively small number of cells *(Feldmann and Male, 1989)*.

B Lymphocytes:

The term B lymphocyte means bursa-derived lymphocyte. It was originally given because, in birds, the bursa of fabricius is held responsible for B cell maturation. In humans, the term B lymphocyte is used to mean bone marrow-derived lymphocyte *(Raff, 1971, and Weissman et al., 1978)*.

The differentiation of haemopoietic stem cells into B lymphocytes and later fully developed plasma cells occurs in two stages. The first stage of clonal development (precursor cells to mature B lymphocytes) is antigen-independent and involves a series of differentiation steps which are dependent on the inductive micro-environment of the primary lymphoid organ. The second stage is antigen-dependent, occurs within the secondary lymphoid tissue and involves clonal expansion of these mature lymphocytes into memory cells and antibody-secreting plasma cells *(Cooper and Lawton, 1974)*.

The mature B lymphocytes, when activated to divide by antigenic stimulation and T cells, enlarge into blasts, divide and then transform back

into small lymphocytes or the memory B cells. These memory B cells are relatively long lived and more easily triggered on subsequent encounters with the same antigen than the virgen B cells *(Weisman et al., 1978).* Memory B cells, along with their T cell counter parts, are resposible for the prompt, heightened antibody responses that result from secondary exposure to an antigen. The final step in B cell differentiation is the mature plasma cell, an immunoglobulin secreting cell. Morphologically B cells look the same as T cells but they can be distinguished by various markers. The most distinctive and useful marker for B cells is their surface immunoglobulin (SIG). This surface immunoglobulin is present in all mature B cells and is the receptor for specific antigen. One of the most important surface components expressed by the B cells is the so called Ia or DR antigens (mouse and human respectively). In mice Ia are required during B cell maturation where as in man the equivalent HLA-DR molecules are expressed on both pre-B and B cells *(Kamps and Cooper, 1982, and Harris and Bhan 1985).*

B cells and Antibodies :

Antibodies belong to a family of large molecules known as immunoglobulins which are proteins made up of polypeptides. Each antibody has two identical heavy polypeptide chains and two identical light chains, shaped to form a Y. The sections that make up the tips of the Y's arms vary greatly from one antibody to another, creating a pocket uniquely shaped to enfold a specific antigen. This is called the variable (V) region. The stem of the Y serves to link the antibody to other participants in the immune defenses. This area is identical in all antibodies of the same class, and is called constant (C) region *(Harris, 1986).*

Each B cell is programmed to make one specific antibody. There are nine chemically distinct classes of immunoglobulins (Ig), four kinds of IgG and two kinds of IgA plus IgM, IgE and IgD. Each type plays a different role in the immune system defense strategy. IgG, the major Ig in the blood, is also able to enter tissue spaces. It works efficiently to coat microorganisms, speeding their uptake by other cells in the immune system, IgM, which usually combines in star shaped clusters, tends to remain in the blood stream, where it is very effective in killing bacteria. IgA concentrates in the body fluids-tears, saliva, secretions of the respiratory and Gastrointestinal tracts (GIT) guarding the entrances to the body. IgE, which under normal circumstances occurs only in trace amounts, attaches itself to the surface of the specialized cells, where it triggers reactions responsible for the symptoms of allergy. IgD is almost exclusively found inserted into the membranes of B cells, where it regulates the cell's activation *(Harris 1986)*.

Phagocytic Cells:

The phagocytes of the body consists of two specialized groups of cells, the myeloid cells (neutrophils), and cells of the mononuclear phagocyte system (blood monocytes and tissue macrophages). The main function of neutrophils is to kill bacteria and other infectious agents by phagocytosis. The mononuclear phagocyte system has two types of cells: phagocytic macrophages whose predominant role is to remove particulate antigens, and antigen presenting cells (APC) whose role is to present antigen to specific antigen-sensitive lymphocytes *(Roitt, et al., 1985)*.

Macrophages:

These cells are derived from bone marrow promonocytes which, after differentiation to blood monocytes, finally settle in the tissues as mature macrophages where they constitute the mononuclear phagocyte system *(Hirsh and Johnson, 1984 and Roitt, 1991 a)*.

Macrophages are present throughout the connective tissue and around the basement membrane of the small blood vessels and are particularly concentrated in the lung (alveolar macrophages), liver (Kupffer cells), the lining of the spleen sinusoids lymph nodes *(Lasser, 1983)* and around the seminiferous tubules *(El-Demiry and James, 1988)*.

Antigens draining into lymphoid tissue are taken up by macrophages. They are then partially, if not completely, broken down in the lysosomes, some may escape from the cell in a soluble form to be taken up by the other antigen-presenting cells and a fraction may reappear at the surface either as a large fragment or as a processed peptide associated with class II major histocompatibility molecules (II MHC). Although resting resident macrophages do not express class II MHC, antigens are usually encountered in the context of a microbial infectious agent which can induce the expression of class II by its adjuvant like properties expressed through molecules such as bacterial lipopolysaccharide (LPs). There is a general agreement that the antigen-presenting cell must bear antigen on its surface for effective activation of lymphocytes. The antigen plus macrophages can stimulate specific T and B cells *(Cline, 1978 and Roitt, 1991 a)*.

The Immune Response:

In respone to the antigen, the reaction of the body is either by a cellular responses (The cell-mediated response) directed by T cells and their secretions or there may be a humoral response, the work of antibodies secreted by B lymphocytes into the body's fliuds or humors (humoral response) *(Reinherz, et al., 1982)*.

It has become increasingly clear that the two arms of the immune response are closely interwind. Almost all antigens evoke both a humoral response and a cellular response. Most B cell receptors require T cell help and reactions involving T cells may take place in association with antibody mediated mechanisms. B cells may function not only in antibody production but also as an antigen presenting cells *(Abbas, 1987)*.

Both B cells and T cells carry special receptor molecules on their surface to recognize and respond to the specific antigens for the B cell this receptor is prototype of the antibody. The B cell is prepared to manufacture and anchore it on its surface. When a B cell encounters a matching antigen in the blood or other body fluids, this antibody-like receptor allows the B cell to interact with it very efficiently *(Roitt, 1991 b)*.

The T cell receptor is more complex. Structurally it is somewhat similar to an antibody, made of a pair of chemically linked chains with variable and constant regions. Unlike B cell, however, a T cell cannot recognize antigen in its natural state. The antigen must first be broken down, and the fragments bound to an MHC molecule, by an antigen-presenting cell. Helper T cell (T_4 cells) look for antigen bound to a class II

MHC molecule. Cytotoxic T cells (T_8 cells), on the other hand, respond to antigen bound to class I MHC molecules which are found on almost all body cells *(Roitt, 1991 b)*.

Humoral Response:

Humoral immunity chiefly involves B cells, although the cooperation of T helper cells is almost always necessary. B cells take in and process circulating antigen. They can bind only antigen that specifically fits their antibody-like receptor.

The B cell exhibits antigen fragments bound to class II MHC molecules. This display attracts mature helper T cells (which may have been already activated by macrophages presenting the same antigen). The B cell and T cell interact, and the helper T cell secretes several lymphokines. These lymphokines set the B cell to multiplying and soon there is a clonel of identical B cells. The B cells differentiate into plasma cells and produce vast quantities of identical antigen-specific antibodies.

Released into bloodstream, the antibodies lock onto matching antigens. The antigen-antibody complexes trigger the complement cascade or are removed from the circulation by clearing mechanisms in the liver and spleen *(Roitt, 1991 b)*.

T Cell Mediated Response:

The development of T cell-mediated reaction depends on proliferation of sensitized T cells in lymphoid tissue following exposure to certain antigens. The reaction is intiated by macrophages or other

presenting cells. The macrophage takes in the antigen, on its own surface bound to an MHC molecule to attract the attention of the T cell. A T cell whose receptor fits this antigen-MHC complex binds to it and this binding can stimulate the macrophage to secrete interlukin-1, which is required for activation of certain T cells. Once activated, the T cell go to work and some subsets of it synthesize and secrete lymphokines.

Interlukin-2, for instance, spurs additional T cell growth. Other lymphokines attract other immature cells (fresh macrophages, granulocytes and other lymphocytes) to the site of infection, while others direct the cells activities once they arrive on the scene. Some subsets of T cells become killer (or cytotoxic) cells, and set out to track down body cells infected by viruses. When infection has been brought under control, suppressor T cells draw the immune response to close *(Abbas, 1987 and Killar, et al., 1987)*.

Rosenberg et al., (1986) stated that four approaches that have been taken to obtain evidence of a role of T cells in human beings are:

* demonstration of in vitro correlates of cell mediated immunity (for example, lymphokines production) following interaction of the patient lymphocytes with putative pathogenic antigens.
* analysis of the phenotype of infiltrating cells in tissue sections by immunohistochemical techiques with monoclonal antibodies.
* in vitro studies of functional properties of cells obtained from lesions.
* the effect of oblation of T cells by administration of monoclonal antibodies.

Immune Response In Schistosomiasis:

Schistosomiasis had always been considered as an essential immunologic disease where schistosomal antigens stimulate both humoral and cellular responses *(Kagan and Pellegrino, 1974)*.

Acute schistosomiasis, defined as clinical disease early (3-15 weeks) after a primary infection with schistosomes, is a febrile, systemic illness characterized immunologically by eosinophilia and the onset of immune responsiveness *(Nathan, et al., 1983 and Gazzinelli et al., 1985)*. Peripheral eosinophilia is a characteristic feature of schistosomiasis *(Mahmoud, et al., 1975, b)*, but more relevant to the immunology of reinfection is the tissue eosinophilia in the pathway of migrating schistosomula, *(Mahmoud, et al., 1975 a)*. In vitro, the antibody responsible for eosinophil adherence in human serum is an IgG *(Butterworth, et al., 1977)*. The adherence of eosinophils to antibody coated schistosomula is through Fc-Fc receptor interaction *(Vadas, et al., 1980)*.

The antibody responsible for eosinophil adherence doesn't appear to be species-specific. Eosinophils will also adhere to schistosomula in the absence of antibody but in the presence of a complement. As a result of complement activation, eospinophil chemotactic factors are released at the parasite surfaces and these may be responsible for increasing the number of cells at the target surface *(Anwar, et al., 1979)*.

A soluble factor named schistosome released products (SRP) from schistosomula, enhances human eosinophils activity particularly their

antibody dependent cytotoxicity against schistosomula and their expression of the Fc receptors *(Auriault, et al., 1982)*. The soluble products released by 6 and 20 days old larvae, as well as, adult worms, also enhance eosinophil activity *(Auriault, et al., 1983)*. This indicates that adult parasites in the infected host are potentially able to enhance eosinophils in their capacity to kill young larvae which penetrate into the infected host.

Adult schistosomes released antigenic material into the circulation of their mammalian hosts. Such antigens have been identified experimentally, as well as in human infections caused by S. hematobium, S. mansoni and S. japonicum *(Quian and Deelder, 1983, Ismail, et al., 1984)*.

The egg of all schistosome species have the common property of inducing inflammatory granulomas or pseudotubercles at the site of their embolization.

T cells were found to play a role in the destruction of Schistosomula by secretion of both lymphokines-which stimulate macrophage to form epithelioid cells and giant cells that destroy the schistosome and eosinophil chemotactic factor which attracts the eosinophils to destroy the schistosomula *(Green and Colly, 1974)*.

The miracidium and the egg secrete histolytic antigens which sensitize the host to develop T-Lymphocyte memory cells which in turn release their lymphokines by further stimulation with antigenic secretions *(Warren and Domingo, 1970)*. Chronic inflammation developed with the

continued secretion of antigens from eggs leading to accumulation of epithelioid cells, giant cells and fibroblasts and formation of dense fibrotic granuloma *(Abaza, 1984)*.

The formation of the granuloma depend on T-helper cells while the modulation of this granulomatous response was found to be dependent on T-suppressor cells *(Phillips, et al., 1980)*.

During chronic schistosomiasis, a marked diminution in the cellular and humoral response was observed. The nature of the immunosuppressive stimulus which originates from the worm is not known. Circumstanial evidence suggests that membrane components of schistosomes may be involved *(Mota-Santos, et al., 1977)*.

The suppressor T cells are found (after 20 weeks of infection with schistosomiasis) to suppress and depress the activity of lymphokine producing T effector cells for cell mediated immunity *(Pelley and Warren, 1978)*.

Patients with schistosomiasis showed a profound alteration of their cellular immune variables, reflecting a severe acquired immunodeficiency syndrome. A defective IL-2 production was assumed to be at the origin of the impaired mitogenic response in chronic schistosomiasis *(Gastl, et al., 1984)*.