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**AIDS: A COMPREHENSIVE UPDATE  
FOR EMBALMERS**

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**Part 1**

*ABSTRACT: AIDS and the various human immunodeficiency viruses are discussed from a current and historical perspective including the political and social ramifications thereof. The chemical and biological morphology of HIV and mechanisms of action are reviewed. The dangers presented during the embalming process are discussed. The various therapies and possible vaccines for HIV are cataloged and discussed. AIDS testing and the implications for the blood supply are overviewed. The mechanisms of transmittal and the comparisons to other STD's are highlighted. Recommendations for embalming protocol are reviewed and discussed in detail.*

**AIDS: PAST AND PRESENT:** Since the elucidation of AIDS (acquired immunodeficiency syndrome) in the early 1980's, this disease has been in the forefront of global research and politics. The research expenditure is absolutely immense and is unprecedented in the history of disease. AIDS is a fatal disease with a typical life expectancy of the infected individual of 6-10 years after positive diagnosis. The actual viral causes of the disease-the HIV type viruses-were discovered and elucidated in 1984. To this day, there is still considerable confusion concerning the actual causative agents of this deadly disease. There are two known viral strains of HIV causing AIDS-the most common being HIV1 and the more rare HIV2. At the World Conference on AIDS in 1992, there was evidence of possible AIDS like diseases that are not caused by the known HIV strains and possibly a new or unknown strain of HIV that is not yet isolated. Later research seems to conclude that these cases are extremely rare disease states not caused by HIV type viruses that mimic the symptomatology of AIDS. Some of the top researchers in this complex field are bitterly divided on the actual viral causative agents of AIDS. It is generally agreed that the HIV strains infecting humans are most probably mutated strains of SIV (simian immunodeficiency virus) that originated in tree monkeys in Africa. Some researchers believe that HIV2 is very little different from SIV and is probably a substrain of it.

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The World Health Organization estimates that there are possibly 10-12 million currently infected with HIV worldwide. This is only an estimate and has been reduced twice since the initial reporting of the statistics. Of the 10-12 million estimate, 1 million are children. There has actually been approximately 2 million documented cases of AIDS confirmed since the diagnosis of the disease in the early 1980's.

It is estimated that approximately 1 million are HIV infected in the USA. There has been 140,000 to 175,000 (possibly slightly higher) documented cases of the disease in the USA. The World Health Organization estimates, by the year 2000, there will be 30-40 million HIV infected individuals worldwide. Confusion about the actual numbers of AIDS cases has come about from many factors, including the continually changing definition of the disease itself. A recent broadening of the clinical definition of AIDS and ARC (AIDS-Related Complex) resulted in an artifactual upsurge in reported AIDS cases during the first quarter of 1993. The increase was attributable to a combination of increased numbers of positive clinical diagnosis and the increasing number of HIV infected individuals becoming clinically symptomatic for AIDS.

Until recently, AIDS in the USA was predominately limited to homosexuals or I.V. drug users. This is counter to the standard method of transmittal throughout the rest of the world-being more like a typical STD (sexually transmitted disease). In fact, globally, AIDS is most typically transmitted through heterosexual prostitution. In the United States, heterosexual transmission is increasing with 90% of new infections being heterosexual in origin. Heterosexual transmittal has increased from 3 to 6% in the United States during the years from 1985-1991. This is still a relatively small number compared to the total HIV infections reported. There is also substantial risk for HIV transmittal from mother to infant with approximately 1/3 of all infants acquiring the disease from their mothers. These changes in the epidemiological factors of AIDS is no doubt due to women being the new vector of this disease in the United States.

There are numerous controversies involving research in the AIDS field due to intense emotional, social and political factors. In late 1992 the U.S. Congress appropriated an unusually large sum (20 million) of the Department of Defense budget for a very controversial vaccine trial for HIV infected individuals that even the researchers themselves admitted was not very promising. A vaccine trial of this nature and scope would, under ordinary circumstances, not have been authorized and funded, but was in fact funded in spite of the evidence due to extreme political and social pressure.

Adding to the political intrigue surrounding the AIDS epidemic is the censuring of the co-discover of the AIDS virus, Robert Gallo, by the U.S. Department of Health and Human Services. Gallo is accused of deliberately misrepresenting the growth ability of early HIV cultures received from the French scientists who also discovered the HIV strains responsible for AIDS. The accusation is that this action resulted in slower progress in AIDS research. This controversy has reopened an earlier controversy over who has the patent rights to the blood tests currently used worldwide for AIDS detection. These tests involve using fragments of the AIDS virus as detectors for HIV antibodies in blood samples. The potential royalty payments are enormous and have triggered lengthy court battles over these patent rights for AIDS testing.

On a less depressing note, the National Institute of Health funded National Research Council released it's study of the AIDS epidemic in early 1993. The essential finding was that despite the lethality of the disease, AIDS will not permanently alter the basic face of American society. The disease will remain in the ethnic, sexual and economic subgroups of society that are currently at the highest risk. These groups would include homosexual/bisexuals, I.V. drug users, poverty-stricken segments of society and the undereducated who will

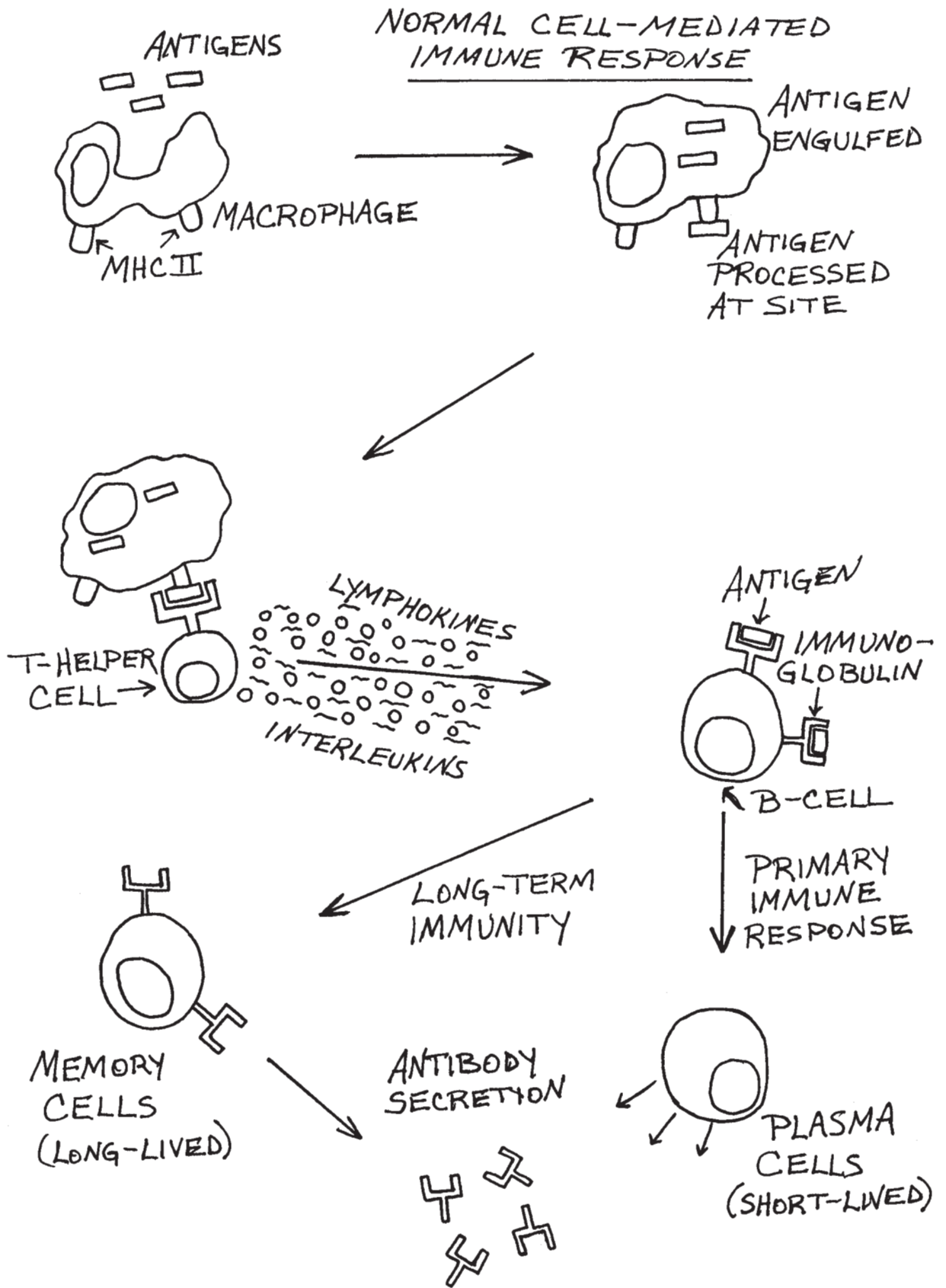


FIGURE 1

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not utilize safeguards against infection. AIDS is expected to slowly isolate itself into these subgroups and remain as a devastating, but controllable, disease. This isolation appears to be already happening. Overall AIDS cases for 1992 increased only 3.5%-down from the previous years 5%. Heterosexually transmitted AIDS increased 17%-also down from 21% as reported in 1990-1991. New female cases declined from 17 to 9 percent. Teenagers with AIDS do not appear to be a potential epidemic with only 170 cases reported in 1991 and 160 cases in 1992 - an actual decline. No pronouncements were made about the global nature of the AIDS epidemic which is probably much more serious and less likely to be effectively controlled, particularly in the underdeveloped countries.

**CHEMICAL/BIOLOGICAL MORPHOLOGY:** The causative agents of AIDS are viruses of a special and curious class termed retroviruses. These viruses are some of the most complex viruses known and have a great propensity to mutate easily. These and other factors make these particular viruses difficult to isolate and investigate in the laboratory. Retroviruses utilize an RNA genome as their hereditary material but only replicate through a DNA intermediate supplied by the infected host. A special enzyme for RNA to DNA replication is present and known as reverse-transcriptase. This enzyme allows the virus to incorporate its genetic material into the host, become dormant, then at a later time regenerate the viral material and bud off as new viruses from within the host cell.

HIV1 and HIV2 are, in fact, members of the Human T-Lymphotropic retrovirus class of infectious agents (commonly referred to as HTLV's). HIV1 and HIV2 were originally designated as HTLV-3 and HTLV-4 to demonstrate this similarity. The HTLV viruses are responsible for lymphoproliferative diseases of human T-cells and are the cause of human adult T-cell leukemias. Occasionally you will find HIV viruses referred to as HTLV's, particularly in the older literature.

The target cell in humans for HIV is unfortunately the CD4 lymphocytes or so-called T-helper cells. CD4 lymphocytes are intimately involved in cell-mediated immune response and infection control. The depletion of CD4 lymphocytes short-circuits the entire immune response in humans with the resultant being a fatal disease. The reason for the propensity of HIV for the CD4 cells is due to the fact that the coat proteins of the virus (gp120 and gp160) preferentially binds to receptor sites on the CD4 lymphocytes. To better understand the unique nature of the disease AIDS, we summarize the normal cell-mediated immune response sequence of events. A virus infects the organism and is recognized as an antigen. The antigen is engulfed by macrophage and is processed as an antigen at a site called a Class 2 MHC (major histocompatibility complex class 2). This complex with attached antigen presents itself to free circulating CD4 lymphocytes (so-called T-helper cells). The T-helper cell is stimulated and secretes various chemical intermediates and activators called lymphokines (interleukins being the most typical) which in turn stimulates B-cells to present immunoglobulins specific for that antigen. B-cells further influence plasma cells to release free circulating antibodies and create memory cells for future immune response and antibody secretion (refer to Figure 1).

It can now be seen how HIV disrupts and completely destroys the immune response in humans. With the CD4 lymphocytes being the preferred binding site, the entire cell-mediated immune response is essentially short-circuited. As more and more CD4 cells are infected and destroyed the immune response slows and slows to the point where the disease is essentially unchecked and the result is a complete shutdown of immune response and death of the organism (refer to Figure 2). There are also HIV coat protein binding sites found in macrophage and mucosal langerhan cells. This perhaps explains the mucosal membrane transmission of HIV through intimate contact such as oral, anal and vaginal modes.