VIROLOGY - CHAPTER SEVEN PART ONE

HUMAN IMMUNODEFICIENCY VIRUS AND AIDS

INTRODUCTION

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The world pandemic of AIDS (Acquired Immunodeficiency Disease Syndrome) has been with us for more than thirty years and about 39 million people have died of the disease. About 1.2 million people around the world die of AIDS each year. Today, at least 36.9 million people are infected and there are more than 7,000 new infections every day. In 2015, 15 million infected persons were receiving anti-retroviral therapy.

Since the late 1970's, HIV and AIDS have spread across the United States (figure 1) and around the world. In sub-Saharan Africa, more than 22 million people are living with HIV infection, accounting for about 70% of total cases.

Despite major success in treating infected people in western countries, the disease has become the major cause of death in many third world countries although chemotherapy with anti-retroviral drugs is reaching an increasing proportion of the infected population. Attempts at making a vaccine have so far proved unsuccessful.

AIDS is caused by Human Immunodeficiency Virus (HIV) which is found in all cases of the disease. The primary targets of HIV are activated CD4+ T4 helper lymphocytes but the virus can also infect several other cell types including macrophages. It is the loss of T4 helper lymphocytes that leads to immunosuppression in the patient and the consequent fatal opportunistic infections.

HIV is a lentivirus, a class of retrovirus. The name lentivirus means slow virus, so called because these viruses take a long time to cause overt disease. Most lentiviruses target cells of the immune system and thus disease is often manifested as immunodeficiency. There are five known serogroups of lentivirus that infect primates, sheep and goats, horses, cats, and cattle.

Lentivirus serogroups

There are two types of HIV: HIV-1 and HIV-2. These cause clinically indistinguishable disease, although the time to disease onset is longer for HIV-2. The worldwide epidemic of HIV and AIDS is caused by HIV-1 while HIV-2 is mostly restricted to west Africa.

Lentiviruses integrate into the host cell genome as a provirus in the same manner as other retroviruses. Unlike other retroviruses, which typically bud from the infected cell for a long

Figure 1. Progression of AIDS in the United States from 1979. Click on icon at left to see moving .gif file CDC

period of time, HIV can lie dormant in the proviral form within a cell for many years, especially in resting (memory) CD4+ T4 lymphocytes, and may set up a lifelong infection. When these cells become reactivated, viral production occurs again and ultimately destroys the cell. Although HIV may disappear from the cells of the circulation, replication and budding continue to occur in other tissues in the absence of chemotherapy. Unlike many other retroviruses, HIV is not transmitted through the germ line.

In the infected patient, HIV can be detected by the presence of anti-HIV antibodies or by the presence of the virus itself using polymerase chain reaction (PCR) that detects viral RNA. PCR is very sensitive and can show HIV in situations in which it is not detectable immunologically.

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