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AIDS: Current Strategies – Is a Cure in Sight?

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Abstract

The AIDS virus, human immunodeficiency virus (HIV), has already spread extensively, infecting about 30 million individuals worldwide. Yet, the epidemic continues to worsen in developing countries, particularly in Africa and, more recently, in Asia. Each day approximately 16,000 individuals become newly infected by HIV, including 1000 children. About 50 million cases are expected by the year 2000. In certain regions of Africa, it is not unusual to find about a third of the population affected by the virus, and AIDS can account for up to 90% of the death in young adults. The social and economic impact of the epidemic is simply devastating for the severely affected countries. HIV infection is now spreading the fastest in Asia. India already has approximately 4-5 million cases, most of which were acquired in only the past few years. Much of Southeast Asia is already severely affected, including the well-known situation in Thailand. Of great concern is the rapid spread of HIV in China. Initially restricted to the Yunnan Province due to the close contact at the Burmese border, HIV is now found diffusely throughout the country, with an estimate of 200,000 infections. A million cases are expected in China by the turn of the century. With the large populations in India, Southeast Asia and China, a critical battle line with HIV must be drawn in this region. The epidemic cannot be allowed to continue to spread like wild fire.

Fortunately, the news on HIV is not all gloom and doom. Much has been learned about the virus, including its genome, structure, life cycle and essential proteins and enzymes. In fact, more is now known about HIV than just about any other virus. Scientists have also unraveled a great deal of what HIV is doing in the context of an infected person. Over the past few years, a picture of a highly dynamic viral replication in vivo has been firmly established. Despite a prolonged period required for HIV to cause the destruction of the human immune system, the virus is never dormant. Instead, its replication is continuous and at a high level. This dynamic viral replication is coupled to a constant destruction of the immune system, which in turn requires constant regeneration. AIDS ensues when the regenerative process falls behind.

The new knowledge gained over the past decade has also allowed scientists in the field to make important advances in HIV therapy. Basic understandings of the virus have resulted in the development of many drugs that target two principal sites of the HIV replication cycle, the enzymes reverse transcriptase and protease. Both are absolutely essential for the continuous replication of HIV. To date twelve drugs have been developed and licensed in the U.S. Recent understanding of the pathogenesis of HIV has led to the development of treatment strategies employing a combination of these drugs, typically a protease inhibitor together with several reverse transcriptase inhibitors. These drug combinations can now

consistently control HIV growth well enough that the virus is no longer detectable in the blood. Although not a cure, these therapies can stop the growth of a virus, halt the destruction of the immune system, and improve the clinical status of the treated patients. In fact, these therapies have caused the mortality rate of AIDS in the US to go down for the first time since the beginning of the epidemic. Consequently, new optimism has been generated by the prospect of controlling HIV replication for a prolonged period of time with the use of these drugs. Scientists and doctors are now working toward the objective of eliminating the virus with the use of these drugs in conjunction with other novel approaches.

Sadly, the new therapies are not available in developing countries where the epidemic is most devastating. Thus, the ultimate control of the global epidemic will depend on preventive measures. Education and campaigns to prevent the further spread of infection must be carried out. In addition, it is likely that the eventual control of the pandemic will depend on the development of an efficacious vaccine to protect susceptible individuals from HIV infection. Considerable amount of the basic science research effort on AIDS is now focused on the development of such a vaccine. It will require a concerted effort among the scientists for the next few years, and hopefully successful vaccinations will be possible within the next decade.