

HIV Disease: From Biology to Chemotherapeutics and Beyond

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Emerging and re-emerging human viral infectious diseases constitute an ever-increasing public health threat with devastating socioeconomic consequences of global proportions. In the last forty years alone, the humanity witnessed a number of devastating viral epidemics such as the one caused by Human Immunodeficiency Virus (HIV), the virus that causes the Acquired Immunodeficiency Syndrome (AIDS). HIV-1 currently infects significant fractions of the worldwide population and causes chronic disease resulting in a major burden to public health. As a result of basic research on HIV/AIDS, combination antiretroviral drug therapy (CART), has been developed to specifically target HIV-1 with outstanding success, resulting in a dramatic fall of mortality among HIV-1-infected individuals. In spite of the dramatic decrease of AIDS-related mortality and the significant increase of life-expectancy among HIV-1-infected people, HIV-1 continues to be transmitted around the world even with higher rates in certain geographic regions. The genetic variability of HIV-1 constitutes the most striking challenge in effectively treating HIV-1 infection. Specifically, the accumulation of drug resistant mutations during suboptimal therapy severely affects the clinical benefits of CART, leading to therapy failure and potentially the transmission of drug-resistant HIV-1 strains to newly-infected individuals. Advanced phylogenetic-based analyses of HIV-1 genomic sequences from HIV-1 sequence databases provide detailed knowledge of old and up-to-date HIV-1 transmission dynamics in human populations in different geographic regions which, is important in identifying populations at risk and in designing better intervention strategies including preventive treatment.

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