HIV

From Biology to Prevention and Treatment

A subject collection from *Cold Spring Harbor Perspectives in Medicine*

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Front cover artwork: The cover art is from the painting *Miracle of Hope II* by David Putnam, which depicts a battle within a single human cell between retroviral drugs (blue dots) and the protease enzyme of HIV (black dots). This painting is part of a series that, in its third panel, shows the protease enzyme 100% annihilated. In *Miracle of Hope II* the battle has reached a fever pitch and the retroviral drugs are on the verge of victory. The tide is turning in favor of the patient being treated and the impending victory is fueled not only by medical science but also the will to live, in other words, hope (http://www.daveputnamart.com).

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Preface

The scale of HIV research is staggering. A search of the PubMed literature database on "HIV" in April 2011 yielded 223,877 scientific papers. In 2010, fully 13,188 papers were published on HIV, or about 36 new papers *a day*. There was once a time when a scholar could expect to read all the literature in their field, but for HIV this task is now impossible.

The breadth of the field is also vast, perhaps to an unprecedented degree. At the smallest scale, research centers on functions of the viral proteins and their interactions with small-molecule inhibitors. Some of the most creative breakthroughs in pharmacology have yielded new classes of HIV drugs, which are now approved by the FDA and widely used. The viral proteins assemble into larger structures, each of which interacts with myriad cellular proteins. The infection process involves single cells, but the disease involves the many different kinds of cells that make up complex tissues and organs. A vast effort centers on understanding the immune response against HIV and manipulating it with vaccines, representing one of the most important areas of public health research today. Research in primatology has revealed the origins of HIV and mechanisms of pathogenesis (or the lack of it) in the many combinations of simian immunodeficiency viruses and their primate hosts. Research on human behavior is another critical area, focused on reducing HIV transmission. Responding to the epidemic worldwide reaches into areas of economics and public policy. And the list goes on.

Given this scale, it is evident that comprehensive reviews of HIV research areas are critical for understanding AIDS, for the development of new treatment and prevention strategies, and for the effective education of physicians, scientists, public health officials, patients, advocates, and the public. This book is composed of 29 chapters, spanning everything from molecular mechanisms of viral replication to pathogenesis and prevention of infection. Because the HIV literature is so extensive, it is not possible to cite every publication on HIV in this book. Each chapter cites key papers and also earlier reviews, which contain large numbers of citations to earlier reports. We apologize in advance for the omission of many high-quality publications because of severe space constraints.

We have also avoided duplicating the encyclopedic *Retroviruses* book, another Cold Spring Harbor publication that is now available through the National Library of Medicine (http://www.ncbi.nlm.nih.gov/books/NBK19376/). We instead have assembled a book that allows people in specific areas of HIV research to access critical and current information about other areas. Studies of animal retroviruses and other human retroviruses are well covered in the earlier book.

Many people helped make this book possible. Barbara Acosta and Richard Sever at Cold Spring Harbor Laboratory Press worked hard to produce the final book. We are grateful to colleagues who read over chapters and helped with edits, including Troy Brady, Peter Cherepanov, Alan Engelman, Rithun Mukherjee, Karen Ocwieja, and Shannah Roth. Kushol Gupta and Fred Hunter provided essential help with movies. Caitlin Greig provided outstanding help with figures.

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[1]Gary J. Nabel's works as editor and author were performed outside the scope of his employment as a U.S. government employee. These works represent his personal and professional views and not necessarily those of the U.S. government.