

Human Immunodeficiency Virus on the Web: A Guided Tour

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Through the efforts of thousands of individuals, the World Wide Web has become a gold mine of information about HIV. In this article, we describe ~90 Web sites that are among the most useful to clinicians and researchers with regard to HIV. Web sites were classified according to their content and target audience and were judged according to their adherence to accepted standards of medical Internet publishing. Selected Web sites were categorized into the following groups: (1) sites with comprehensive coverage of HIV treatment and its management, (2) on-line peer-reviewed journals, (3) proceedings of scientific meetings, (4) sites with HIV-related textbooks, manuals, and guidelines, (5) government publications, (6) research databases, (7) information on clinical trials, (8) sites with comprehensive information for laypersons, and (9) sites with information related to specific medical complications of HIV infection.

A variety of factors make it more challenging to keep up with current information about HIV infection and treatment than with information about any other area of medicine or medical research. First, HIV-related medicine and HIV research are interdisciplinary endeavors, and new findings in these areas are published and presented in a wide variety of venues. Second, the virus itself is evolving as it spreads through the world's populations, presenting a moving target to researchers and clinicians. Third, HIV infection is treatable but incurable. As a consequence, there is a justifiable sense among infected patients and their physicians that the very latest treatment may be better than current standard protocols.

The Internet has become an invaluable source of medical information. In no field of endeavor is this more apparent than in the extraordinarily rapidly changing domain of HIV medicine. In this article we provide a road map to Internet sources of reliable information for clinicians, researchers, and HIV-infected individuals. This review focuses on English-language Web sites devoted to HIV in adults.

Methods

Web sites were identified on the basis of personal knowledge, interactions with colleagues, links from known sites, the use of search engines, and a MEDLINE search for articles dealing with HIV and the Internet. This eclectic approach was adopted because

there is no standard approach to identify important Web sites in any field, including medicine. Web sites were classified according to their content and target audience and were judged according to their adherence to accepted standards of medical Internet publishing. These standards require that Web documents contain author information, content references, dates on which the content was posted, and disclosure of commercial funding arrangements or other potential conflicts of interest [1–3]. Access to material on most sites described here is free. However, sites that are currently free may eventually demand an on-line subscription. No distinction was made between free sites that require registration and those that do not.

Results and Discussion

Comprehensive Sites

Of the Web sites in this category (table 1), HIV InSite, Medscape, and the Johns Hopkins AIDS Service provide the most original content. Each of these sites has authoritative, well-written reviews of HIV-related meetings and recently published papers, daily news summaries, continuing medical education (CME) courses, HIV-related drug summaries, and links to key Web publications.

HIV InSite is the most comprehensive of the sites. It provides full-text access to *The AIDS Knowledge Base* [4], a custom search interface to both the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) surveillance data sets (through the link Statistics), and an independently researched HIV clinical trials database (at the link Trials Search). Additional useful features include clinical case discussions, a page devoted to the International AIDS Society and its excellent journal *Topics in HIV Medicine*, and a biweekly electronic newsletter that alerts subscribers to new information on the site.

Johns Hopkins AIDS Service Web site provides full-text ac-

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The tables in this article also appear at <http://hivdb.stanford.edu/hiv/links.html>; they are modified here.

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Table 1. Comprehensive HIV/AIDS Web sites.

Web site name	Address	Description
HIV InSite	http://hivinsite.ucsf.edu	News, reviews, CME, textbook (AIDS Knowledge Base [4]), gateway
Johns Hopkins AIDS Service	http://www.hopkins-aids.edu	News, reviews, treatment manual
Medscape	http://www.medscape.com	News, reviews, CME
JAMA HIV/AIDS Information Center	http://www.ama-assn.org/special/hiv	News, reviews, CME
IAPAC	http://www.iapac.org	News, reviews
HIVandHepatitis.com	http://www.hivandhepatitis.com	News, reviews
Physicians' Research Network	http://www.prn.org	News, reviews

NOTE. CME, continuing medical education; IAPAC, International Association of Physicians in AIDS Care; JAMA, *Journal of the American Medical Association*; UCSF, University of California at San Francisco.

cess to the manual *Medical Management of HIV Infection* [5]. In addition, it contains expert responses to questions sent in by both patients and clinicians. Some of the material is reproduced in the *Hopkins HIV Report* bimonthly newsletter for HIV practitioners, which can also be accessed from the site.

Medscape is a commercial site supported by advertising and grants from pharmaceutical manufacturers of antiretroviral agents. It is most useful for its same-day conference summaries, its Quick Guide to Antiretrovirals, a section that allows for rapid screening for pharmacokinetic drug interactions, and a Medication Daily Scheduler. Medscape also contains material from *The AIDS Reader*, a publication designed to review clinical issues commonly faced by physicians treating HIV-infected patients.

The *Journal of the American Medical Association* Web site has well-written news and reviews and provides on-line CME courses. The International Association of Physicians in AIDS Care (IAPAC) site contains news and conference reviews as well as provocative, well-written editorials. The IAPAC site also maintains a comprehensive list of upcoming conferences. HIV-andhepatitis.com provides news, well-written reviews, and Web-

casts. The Physicians' Research Network Web site features timely reviews written by the site's editorial faculty members.

Journals

Clinical HIV studies are generally published in one of the leading medical journals or in one of the infectious diseases or HIV/AIDS journals. However, studies of HIV-related complications may appear in a wide variety of subspecialty medical journals. Scientific studies are generally published in leading journals devoted to specific scientific disciplines (e.g., virology, biochemistry, structural biology, or immunology) or in the HIV/AIDS journals. On-line availability of full-text versions of many of the journals with important HIV-related publications should dramatically improve the ability of physicians and researchers to remain current with regard to knowledge about HIV.

Table 2 lists the majority of available HIV/AIDS journals and describes the on-line availability of their articles. The National Library of Medicine (NLM) provides links to the Web sites of ~700 journals that provide full-text articles on-line.

Table 2. Web sites of biomedical journals that regularly publish clinical and scientific HIV studies.

Journal	Address	Description
<i>New England Journal of Medicine</i>	http://www.nejm.org	Full text since 1990
<i>Annals of Internal Medicine</i>	http://www.acponline.org/catalog/journals	Full text since 1995
<i>Journal of the American Medical Association</i>	http://jama.ama-assn.org	Full text since 1999
<i>The Lancet</i>	http://www.thelancet.com	Full text since 1996
<i>British Medical Journal</i>	http://www.bmj.com	Full text since 1994
<i>Morbidity and Mortality Weekly Report</i>	http://www.cdc.gov/hiv/pubs/mmwr.htm	Full text since 1981
<i>Nature Medicine</i>	http://www.nature.com/nm	Full text since 1998
<i>Proceedings of the National Academy of Sciences</i>	http://www.pnas.org	Full text since 1990
<i>Science</i>	http://www.sciencemag.org	Full text since 1996
<i>Nature</i>	http://www.nature.com	Full text since 1997
<i>AIDS</i>	http://www.aidsonline.com	Full text since 1997
<i>AIDS Research and Human Retroviruses</i>	http://www.liebertonline.com	Full text since 1997
<i>Journal of Acquired Immune Deficiency Syndromes</i>	http://www.jaids.com	Full text since 1996
<i>Antiviral Therapy</i>	http://www.intmedpress.com	No on-line access
<i>Journal of Infectious Diseases</i>	http://www.journals.uchicago.edu/JID	Full text since 1998
<i>Clinical Infectious Diseases</i>	http://www.journals.uchicago.edu/CID	Full text since 1999
<i>Journal of Clinical Microbiology</i>	http://jcm.asm.org	Full text since 1995
<i>Antimicrobial Agents and Chemotherapy</i>	http://aac.asm.org	Full text since 1995
<i>Journal of Virology</i>	http://jvi.asm.org	Full text since 1995

Most of the journals that provide full-text articles require a paid subscription.

Scientific Meetings

As noted in the introduction, the state of urgency that exists in the field of HIV practice and research makes up-to-date knowledge of meeting abstracts and presentations particularly important. However, few people can attend even a small proportion of the HIV-related meetings held around the world. In the past, scientific results presented at such meetings often spread by word of mouth—a potentially unreliable method of data-sharing—but coverage of these meetings on the Web has improved this situation dramatically.

Web sites covering some of the most important HIV-related meetings are listed in table 3. Several of these are exemplary for their content. For example, beginning last year, the Web site of the annual Conference on Retroviruses and Opportunistic Infections made available meeting abstracts and posters. Many of the oral presentations are also available as Webcasts. In addition, the comprehensive sites discussed above often have valuable editorials summarizing the salient points of recent meetings.

Clinical Guidelines, Textbooks, and other Reference Materials

The US Department of Health and Human Services (DHHS), together with the Henry J. Kaiser Family Foundation, has convened a number of expert panels to provide up-to-date guidelines that address many fundamental aspects of the clinical management of HIV infection. These guidelines are well-written and authoritative and provide sufficient background information and references to ensure readers' thorough understanding. The guidelines are often published in journals, particularly the *Morbidity and Mortality Weekly Report*, but the most up-to-date versions ("living documents") are available

from the HIV/AIDS Treatment Information Service (HIV ATIS; figure 1 and table 4).

Additional general information on HIV infection can be found in *The AIDS Knowledge Base* [4] at HIV InSite and in the Johns Hopkins University manual *Medical Management of HIV Infection* [5], which is focused on the diagnosis and treatment of HIV infection and more closely resembles the DHHS guidelines. *The AIDS Knowledge Base* [4] is a comprehensive textbook that includes continually updated chapters on HIV pathogenesis and clinical syndromes as well as information on diagnosis and treatment.

Both of these references have excellent chapters on HIV drug complications and drug interactions—information that is essential for even the most expert clinician. If these chapters do not address the specific drug interaction or drug side effect of interest, some of the additional sites listed in table 4 may be helpful. For example, Medscape has a program that allows users to select a particular multidrug regimen and receive feedback on potential interactions between the drugs. PDR.net and RxList are free sites that provide the most comprehensive information on HIV- and non-HIV-related drugs, including the texts of package inserts.

The National HIV Telephone Consultation Service ("Warm-line") offers health care providers up-to-the-minute clinical information and case consultation. The Warmline is staffed by clinicians experienced in HIV-related care and is accessible on weekdays. The National Clinicians' Post-Exposure Prophylaxis Hotline (PEpline) offers clinicians around-the-clock advice on managing their own occupational exposures to HIV, hepatitis virus, and other bloodborne pathogens. Detailed information about these services can be found on their Web sites (table 4).

Because HIV-related problems cannot be evaluated independently from a patient's other medical problems, we have listed several other on-line references for the clinician in table 4. Medical Matrix is devoted to posting, annotating, and continuously updating full-content clinical medicine resources. The site con-

Table 3. Web sites that provide access to HIV-related scientific meetings.

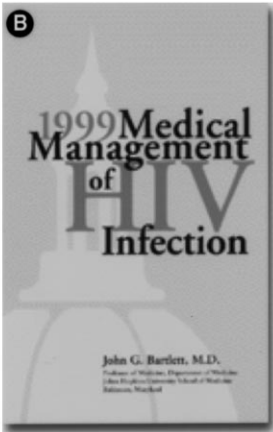
Meeting	Web address	Comments
Conference on Retroviruses and OIs	http://www.retroconference.org	Sponsored by NIAID and CDC; abstracts (1997–2000), posters (1999–2000), and selected presentations (1999–2000) are on-line
International AIDS Conference	http://www.hivnet.ch/mirror/aids98/ (12th); http://www.aids2000.com (13th)	Sponsorship varies with host country; 1998 abstracts and selected presentations are on-line
ICAAC	http://www.asm.org/mtgsrsrc/mtgs.htm	Sponsored by ASM; abstracts and tapes can be ordered on-line
Annual Meeting of the IDSA	http://www.idsociety.org/ME/toc.htm	Sponsored by IDSA; abstracts and videotapes can be ordered on-line
Workshop on HIV Drug Resistance	http://www.intmedpress.com/resistance	Sponsored by International Medical Press; abstracts can be ordered on-line
Adverse Drug Reactions and Lipodystrophy	http://www.intmedpress.com/lipodystrophy	Sponsored by International Medical Press; abstracts can be ordered on-line
(Various)	http://www.iapac.org/clinmgt/conferences/conflist.html	A comprehensive listing prepared by IAPAC

NOTE. ASM, American Society for Microbiology; CDC, Centers for Disease Control and Prevention; IAPAC, International Association of Physicians in AIDS Care; ICAAC, Interscience Conference on Antimicrobial Agents and Chemotherapy; IDSA, Infectious Diseases Society of America; NIAID, National Institutes of Allergy and Infectious Diseases; OIs, opportunistic infections.

A Current Treatment Guidelines Library **HIV/AIDS** TREATMENT INFORMATION SERVICE

Adult | Pediatric | Perinatal | Health-Care | Nonoccupational | Opportunistic | Tuberculosis

B



C Insight From Experts
America's leading experts answer your questions. Visit the:

- FATIGUE AND ANEMIA forum
- HIV AND ORAL HEALTH forum
- MANAGING SIDE EFFECTS AND SYMPTOMS forum
- OPPORTUNISTIC INFECTIONS forum
- TREATMENT forum
- TRATAMIENTOS **NEW!**
- VIRAL LOAD AND RESISTANCE TESTING forum
- WASTING, DIET, NUTRITION, AND EXERCISE forum
- WOMEN AND CHILDREN forum **NEW!**
- ADDITIONAL forums

D

Trials Search: Online Guide to HIV Clinical Trials

Treatments and Medications Tested
Select one or more

ABLC
ABT-378/Ritonavir
AG-1549
AIDSVAX B/B

Study Type All Observational Interventional

E

THE AIDS KNOWLEDGE BASE

HOME | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | SEARCH

Figure 1. A selection of several Web resources useful for the clinical management of HIV infection. *A*, Index to the HIV/AIDS Treatment Information Service (ATIS) guidelines (<http://www.hivatis.org/trtgdlns.html>). These guidelines are frequently updated “living documents” written by expert panels selected by the US Department of Health and Human Services. *B*, Book cover of *Medical Management of HIV Infection* [5], a manual of HIV diagnosis and therapy that is published yearly and available on the Johns Hopkins AIDS Service Web site (<http://www.hopkins-aids.edu/>). *C*, Introduction to the section Insight from Experts on the Web site The Body (<http://www.thebody.com>). *D*, HIV InSite clinical trials search engine (<http://never.ucsf.edu:8000/tsearch/>). *E*, Banner for HIV InSite’s on-line textbook, *The AIDS Knowledge Base* [4], which contains sections on all aspects of HIV infection, including epidemiology, pathogenesis, clinical manifestations, diagnosis, treatment, and prevention (<http://HIVInSite.ucsf.edu/akb>).

tains a list of on-line textbooks, including both books that are free and those requiring a paid subscription. Finally, there are an increasing number of general medical information sites that provide access to multiple medical texts for paid subscribers.

Government Sites

Table 5 lists 4 United States government sites and the WHO–Joint United Nations Programme on AIDS (UNAIDS) site. The home page of the National Institutes of Allergy and Infectious Diseases (NIAID) provides information about its funding programs, which includes links to its Centers for AIDS Research, AIDS Clinical Trials Group sites, CPCRA, HIV-NET, and vaccine evaluation programs. It also includes a resource guide for the development of AIDS therapies, as well

as access to a few AIDS-related data sets. Finally, the page also provides links to many National Institutes of Health (NIH)–sponsored projects.

The CDC Web site gives access to the *Morbidity and Mortality Weekly Report*, HIV surveillance data, prevention research, and guidelines on a variety of other topics, including HIV testing. The CDC National Prevention Information Network contains >10,000 publications for patients and health-care providers.

Access to the bulk of the Adult AIDS Clinical Trials Group (ACTG) Web site is accessible only to researchers at one of the ~25 AIDS Clinical Trial Units. It contains detailed descriptions of ACTG protocols, including executive summaries that are released after studies are completed but before the results are published. The ACTG site also contains useful technical data

Table 4. Web sites with clinical guidelines, books, and other reference materials concerning HIV.

Name	Address	Description
<i>The AIDS Knowledge Base</i>	http://hivinsite.ucsf.edu/akb	Textbook whose authors work at San Francisco General Hospital and UCSF [4]
<i>Medical Management of HIV Infection</i>	http://www.hopkins-aids.edu/publications/index_pub.html	Manual of diagnosis and treatment [5]
Guidelines for the Use of Antiretroviral Agents in HIV-Infected Adults and Adolescents	http://www.hivatis.org/trtgdlns.html	Guidelines written by DHHS
HIV prevention: (1) Perinatal transmission; ^a (2) Occupational exposure; ^b (3) Nonoccupational exposure ^c	http://www.hivatis.org/trtgdlns.html	Guidelines written by PHS
(1) Opportunistic infection; ^d (2) Tuberculosis infection ^c	http://www.hivatis.org/trtgdlns.html	(1) Guidelines of the PHS and IDSA; (2) Guidelines of the PHS
IAS Anti-HIV Treatment Guidelines	http://www.ama-assn.org/special/hiv/library/scan/jan00/jan00d.htm	Recommendations of IAS-USA Panel (January, 2000)
IAS Drug Resistance Testing Guidelines	http://www.ama-assn.org/special/hiv/library/scan/may00/may00a.htm	Recommendations of IAS-USA Panel on antiretroviral drug resistance testing (May, 2000)
Clinical anti-HIV drug information		
HIV InSite Drug Database	http://arvdb.ucsf.edu/index.cfm	HIV InSite Web site
Medical Management of HIV Infection	http://www.hopkins-aids.edu/index_hiv_sitemap.html	
HIV: Drug Interactions	http://hiv.medscape.com/Medscape/HIV/DrugInteractions/index.cfm	Medscape program to check a drug regimen for adverse interactions
HIV Treatment: Drug Interactions	http://www.hivatis.org/druginteractions.html	Extensive pharmacological data
<i>Physician's Desk Reference</i>	http://www.pdr.net	Comprehensive drug information, including the full texts of package inserts
RxList	http://www.rxlist.com	Comprehensive drug information, including the full texts of package inserts
National HIV Telephone Consultation Service	http://www.ucsf.edu/warmline/	Case consultation for physicians, nurses, and other health-care providers ("Warmline"); 800-933-3413 and 415-476-7969
National Clinicians' Post-Exposure Prophylaxis Hotline (PEpline)	http://epi-center.ucsf.edu/PEpline/	Around-the-clock advice on managing occupational exposures to HIV, hepatitis, and other bloodborne pathogens (888-HIV-4911)
Medical Matrix	www.medmatrix.org/_SPages/textbooks.asp texts	Comprehensive list of on-line medical textbooks

NOTE. DHHS, US Department of Health and Human Services; IAS, International AIDS Society; PHS, Public Health Service; UCSF, University of California at San Francisco.

^a PHS Task Force Recommendations for the Use of Antiretroviral Drugs in Pregnant Women Infected with HIV-1 for Maternal Health and Reducing Perinatal HIV-1 Transmission.

^b PHS Guidelines for the Management of Health-Care Worker Exposures to HIV and Recommendations for Postexposure Prophylaxis.

^c Management of Possible Sexual, Injecting-Drug-Use, or Other Nonoccupational Exposure to HIV, Including Considerations Related to Antiretroviral Therapy.

^d 1999 USPHS/IDSA Guidelines for the Prevention of Opportunistic Infections in Persons Infected with HIV.

^e Prevention and Treatment of Tuberculosis Among Patients Infected with HIV: Principles of Therapy and Revised Recommendations.

(e.g., the *ACTG Virology Manual*), frequently updated drug information, and a comprehensive members directory.

The HIV-related Web site of the US Food and Drug Administration (FDA) contains a large amount of data derived from presentations made by pharmaceutical and diagnostic companies, as well as the deliberations of advisory groups. Although this information is often difficult to access, the NIH AIDS Clinical Trials Information Service (ACTIS) provides a specialized search engine for FDA documents (use the Search Site page).

The UNAIDS consists of WHO and 6 other international organizations, including UNICEF, UNESCO, and WORLD Bank. The WHO-UNAIDS Web site contains the most complete data on HIV global epidemiology, including country-specific data. It also contains monographs on HIV vaccine and prevention strategies.

Research Databases

Research databases are listed in table 6. MEDLINE, AIDS-LINE, AIDS DRUGS, and AIDSTRIALS are databases of the NLM. MEDLINE contains bibliographic citations and author abstracts from >4000 biomedical journals published throughout the world. AIDS LINE currently provides no significant advantage over MEDLINE; in addition to MEDLINE references, its only other sources are material from the 12th International AIDS Conference and articles from out-of-date, non-peer-reviewed publications. PubMed is the NLM's search service that provides access to MEDLINE. PubMed's users should note the tools named Limits, History, and Clipboard and the MeSH Browser, which will allow them to perform their searches optimally. AIDS DRUGS, and AIDSTRIALS contain information about experimental HIV drugs and ongoing and completed HIV clinical trials.

Table 5. Government Web sites related to HIV/AIDS.

Institution	Address	Description
NIAID	http://www.niaid.nih.gov/research/daids.htm	Guide to funding for individuals and programs (e.g., CFAR, ACTG, CPCRA, HIVNET); links to NIH-sponsored projects
CDC Division of HIV/AIDS Prevention	http://www.cdc.gov/hiv/dhap.htm	Surveillance data (slide sets), prevention research, patient brochures, HIV testing guidelines
CDC National Prevention Information Network	http://www.cdcnpi.org/topic/start.htm	Contains >10,000 documents for patients and health-care providers
WHO/UNAIDS	http://www.unaids.org	Global epidemiology, including country-specific data (slide sets) and vaccine and prevention strategies
ACTG	http://aactg.s-3.com	Password required for ACTG protocols, technical documents (e.g., <i>ACTG Virology Manual</i>), member directory
FDA	http://www.fda.gov/oashi/aids/hiv.html	Contains an extensive amount of information on drugs and diagnostic tests; although specific data are often difficult to access, the search engine at ACTIS (Search Site page) is a good starting point

NOTE. ACTG, The Adult AIDS Clinical Trials Group; CDC, Centers for Disease Control and Prevention; CFAR, Centers for AIDS Research; CPCRA, Community Programs for Clinical Research on AIDS; FDA, US Food and Drug Administration; NIAID, National Institutes of Allergy and Infectious Diseases; UNAIDS, Joint United Nations Programme on AIDS; WHO, World Health Organization.

GenBank is an annotated collection of all publicly available DNA sequences maintained by the NIH. As of January 2000, it contained >5 million sequence records and >6 billion nucleotides [6]. GenBank, the European Molecular Biology Laboratory, and the DNA DataBank of Japan exchange data daily and together make up the International Nucleotide Sequence Database Collaboration. These primary sequence databases (figure 2) contain sequence data for tens of thousands of genes, but because they rely on passive reporting they are often missing important unpublished sequence data sets.

The Protein Data Bank (PDB) is the international repository for the processing and distribution of 3-dimensional macromolecular structure data primarily determined by x-ray crystallography and nuclear magnetic resonance [7]. The National Center for Biotechnology Information has created an integrated information-retrieval system entitled Entrez, which is based on links between MEDLINE, GenBank, and PDB entries [8].

The HIV Sequence Database (Los Alamos Database) maintained at Los Alamos National Laboratories is a publicly available, curated database of HIV sequences. It has the following

Table 6. Web sites with HIV/AIDS research databases.

Database	Address	Description
PubMed access to MEDLINE AIDSLINE, AIDSDRUGS, and AIDSTRIALS	http://www.ncbi.nlm.nih.gov	NLM bibliographic database
GenBank and Entrez	http://www.igml.nlm.nih.gov http://www.ncbi.nlm.nih.gov/entrez	NLM bibliographic, drug, and clinical trials database GenBank contains genetic sequence data; Entrez integrates sequence data with MEDLINE and Protein Data Bank
Protein Data Bank	http://www.rcsb.org/pdb	International repository for the processing and distribution of 3-D macromolecular structure data
HIV Sequence Database	http://hiv-web.lanl.gov	Maintained by the Theoretical Biology Group at Los Alamos National Laboratories; contains curated HIV sequence alignments, analysis research tools, technical reviews, and an updated compilation of drug-resistance mutations
HIV Molecular Immunology Database	http://hiv-web.lanl.gov/immunology/index.html	Maintained by the Theoretical Biology Group at Los Alamos National Laboratories; contains an annotated, searchable collection of HIV-1 cytotoxic and helper T-cell epitopes and antibody binding sites
HIV RT and Protease Sequence Database	http://hivdb.stanford.edu/hiv/	Maintained at Stanford University; annotated collection of reverse transcriptase and protease sequences linked to drug-treatment histories and drug susceptibility test results
AIDS Reagent Program	http://www.aidsreagent.org	Funded by DAIDS (NIAID); maintains and provides laboratory research reagents, including cell lines, viruses, and proteins
Anti-HIV Compounds	http://www.niaid.nih.gov/daids/dtpdb	Funded by DAIDS (NIAID); chemical structures, in vitro activity of approved and experimental compounds
HIV Protease Database	http://www.ncifcrf.gov/HIVdb	Structural database maintained at the NCI, devoted to HIV and SIV protease
EuroSIDA	http://www.chip.suite.dk/Eurosidaindex.htm	EuroSIDA study is a prospective observational cohort of 8500 patients in 20 European countries
Cochrane Collaborative Review Group on HIV Infection and AIDS	http://hivinsite.ucsf.edu/cochrane	Systematic reviews on the prevention and treatment of HIV

NOTE. DAIDS (NIAID), Division of AIDS (National Institutes of Allergy and Infectious Diseases); NCI, National Cancer Institute; NLM, National Library of Medicine; RT, reverse transcriptase; SIV, simian immunodeficiency virus; 3-D, 3-dimensional.

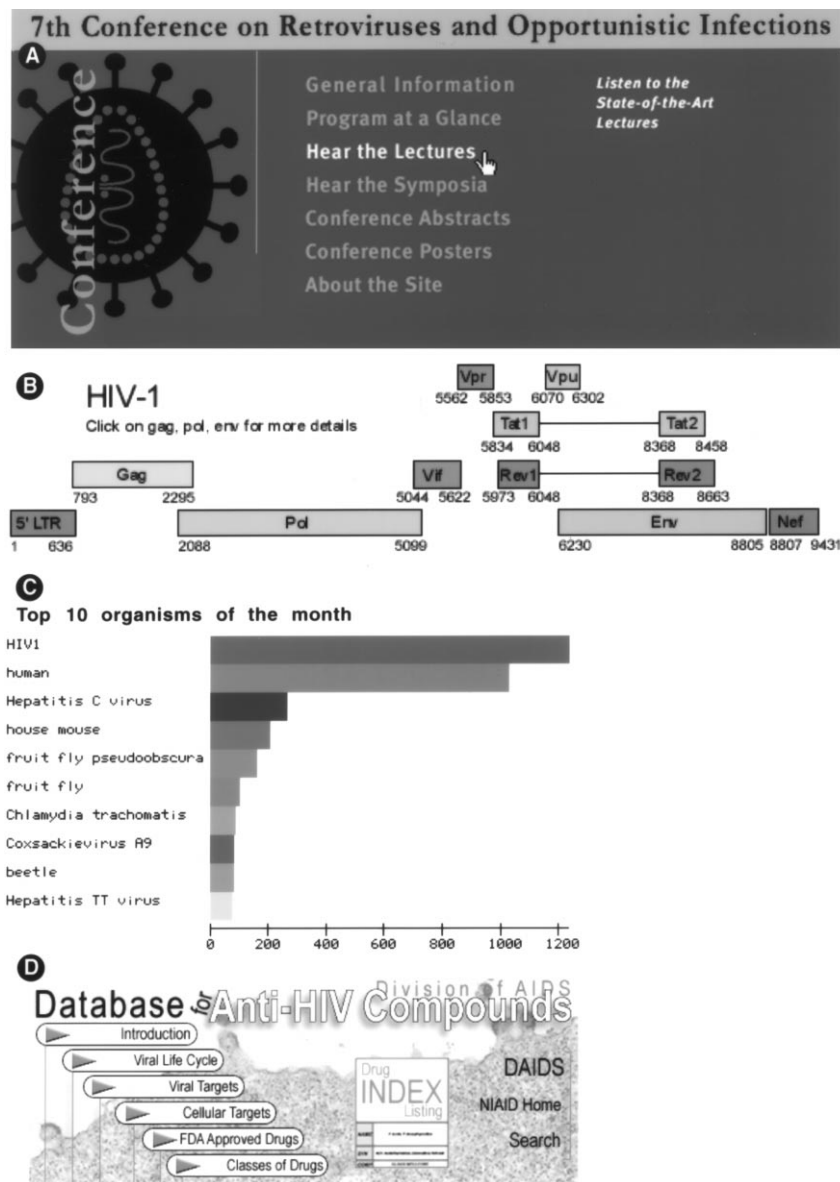


Figure 2. A selection of several Web resources useful for HIV researchers. *A*, Web site of the 7th Conference on Retroviruses and Opportunistic Infections (<http://www.retroconference.org>). This Web site features abstracts, posters, and several oral presentations from the 1999 and 2000 meetings. *B*, User interface for HIV-MAP, a tool created by the HIV Sequence Database (the Los Alamos Database; <http://hiv-web.lanl.gov>) that allows users to download the sequences of a specific HIV-1 region. *C*, The number of new nucleotide sequences processed by GenBank in January 2000 (<http://www.ncbi.nlm.nih.gov/Entrez>). HIV-1 was 1 of the top 5 most-sequenced organisms during the first 4 months of 2000. *D*, The database for Anti-HIV Compounds is found at the Web site of the Division of AIDS at the National Institutes of Allergy and Infectious Diseases (<http://www.niaid.nih.gov/daids/dtpdb>).

goals: (1) collecting, curating, and annotating HIV and simian immunodeficiency virus (SIV) sequence data; (2) providing users with curated sequence alignments; (3) providing software tools for analyzing HIV sequence data; (4) performing meta-analyses and combined analyses of published sequence data; and (5) publishing its data and analyses in a yearly printed publication, the

HIV Sequence Compendium [9]. The Los Alamos Database contains a large number of software tools and unique research reviews, which makes it an essential site for researchers in many disciplines. Its companion database, the HIV Molecular Immunology Database, contains an annotated, searchable collection of HIV-1 cytotoxic and helper T-cell epitopes and antibody

Table 7. Web sites with information on HIV/AIDS clinical trials.

Institution	Address	Description
ACTIS (NIAID)	http://www.actis.org	Summary of completed and ongoing trials; uses AIDS-DRUGS and AIDS-TRIALS databases; excellent FDA search engine
AMFAR	http://www.amfar.org	News updates pertaining to clinical trials; patient information, including AIDS Drug Assistance Program (ADAP) and expanded-access protocols
HIV InSite Trials Search	http://never.ucsf.edu:8000/tsearch	Clinical trials database search
AIDS Treatment Data Network	http://www.aidsinfonyc.org/network	Browsable guide for health-care personnel and patients
Canadian HIV Trials Network	http://www.hivnet.ubc.ca/ctn.html	Ongoing and completed clinical trials in Canada
Initio Trial	http://www.ctu.mrc.ac.uk/initio	Large European multicenter, randomized trial of treatment protocols for previously untreated, HIV-infected individuals

NOTE. ACTIS, AIDS Clinical Trials Information Service; AMFAR, American Federation of AIDS Research.

binding sites. The Los Alamos Database also maintains a list of published drug-resistance mutations and references that can be browsed (with use of the compendium) or searched [10].

The HIV RT (reverse transcriptase) and Protease Sequence Database at Stanford University is an interactive database designed for researchers studying evolutionary and drug-related HIV RT and protease sequence variation [11]. The database links HIV RT and protease sequences to the drug-treatment histories of the individuals from whom sequenced isolates were obtained and to drug susceptibility data, if available. Users can retrieve sets of sequences that meet specific criteria, such as those having a particular mutation, or that occur during a specified treatment regimen. The Web site also has an HIV RT and protease sequence analysis program created for laboratories that perform genotypic HIV resistance tests.

The Division of AIDS at the NIAID has established the Database for Anti-HIV Compounds. It contains chemical structures and biological data acquired by continuous surveillance of primary literature sources. The database Web site is divided into sections on the virus life cycle, viral targets, cellular targets, and anti-HIV drugs. The HIV Protease Database was created by the Program in Structural Biology at the National Cancer Institute. It contains an archive of experimentally determined HIV and SIV structures, including some which are not in the PDB. It also contains a variety of tools for structure analysis.

Since 1988, the AIDS Reagent Program funded by the NIH has provided the research community with state-of-the-art biological and chemical materials for the study of HIV and related opportunistic infections. More than 1670 reagents are available to registered users. The on-line catalog includes antibodies, cell

lines, HIV isolates, opportunistic pathogens, and DNA and peptide reagents.

EuroSIDA is a prospective observational cohort study of 8500 patients in 20 European countries. This site contains information important to study participants, as well as some of the study's published results [12]. The Cochrane Collaborative Review Group on HIV Infection and AIDS publishes peer-reviewed systematic reviews on the prevention and treatment of HIV infection.

Clinical Trials Sites

ACTIS allows users to search the NLM databases, AIDS-TRIALS, and AIDS-DRUGS. The ACTIS site (table 7) also contains the AIDS Clinical Trials Results Database, which contains references to journal articles presenting the interim or final results of HIV/AIDS-related clinical trials. It also contains links to the majority of the ACTG clinical sites, to the Terry Beinr Community Programs for Clinical Research on AIDS (CPCRA) community-based clinical trials network, and to sites doing preclinical and clinical work on HIV vaccines.

AMFAR, the AIDS Treatment Data Network, and HIV InSite Trials Search also allow users to search a clinical trials database. The HIV InSite database is independently researched and may contain protocols that are not in the ACTIS database. Search results include a list of the names of trials meeting the search criteria, brief summaries of the trials, and links to more detailed information about the trials. Each of the clinical trials Web sites also provides useful information about pharmaceutical company and State Drug Assistance programs, as well as

Table 8. HIV/AIDS Web sites for patients.

Name	Address	Description
HIV ATIS: Glossary of HIV/AIDS-Related Terms	http://www.hivatis.org/glossary	3d edition of the DHHS HIV/AIDS glossary
Positive Living	http://hivatis.org/geninfo.html	American Social Health Association booklet for newly diagnosed persons
Aidsmap	http://www.aidsmap.com	British HIV Association; excellent clinical review
Project Inform	http://www.projinform.org	Patient education
Bulletin of Experimental Treatments for AIDS	http://www.sfaf.org/beta	Patient education
Aegis	http://www.aegis.com	News, patient newsletters, physician-oriented review journals
The Body	http://www.thebody.com	News, reviews, "Insight from Experts"
National AIDS Treatment Advocacy Project	http://www.natap.org	Comprehensive, sophisticated coverage of meetings on HIV treatment

NOTE. HIV ATIS, HIV/AIDS Treatment Information Service.

Table 9. Web sites related to specific HIV-related complications.

Topic, Web site name	Address	Description
Malignancy		
CancerNet	http://cancernet.nci.nih.gov/Cancer_Types/AIDS-Related_Malignancies.shtml	Information on Kaposi's sarcoma and lymphoma; for health-care professionals and patients
OncoLink	http://oncolink.upenn.edu/disease/kaposi/	Information on Kaposi's sarcoma and lymphoma; for health-care professionals and patients
Hepatitis		
HIVandHepatitis.com	http://www.hivandhepatitis.com	News and summaries of selected topics related to HIV, hepatitis B, and hepatitis C
CDC: Viral Hepatitis	http://www.cdc.gov/ncidod/diseases/hepatitis/	CDC site on hepatitis
Drug resistance		
HIVresistance.com	http://www.hivresistance.com	Short reviews on selected aspects of drug resistance for physicians and lay persons (see also the HIV Sequence Database at Los Alamos and the HIV RT and Protease Sequence Database at Stanford, in the Research Databases section; table 6)
HIV InSite: Resistance & Resistance Testing	http://HIVInSite.ucsf.edu/topics/links/resistance_resistance_testing/	Links to the web pages of the companies providing resistance assays
Women		
Women & HIV Infection	http://www.hivpositive.com/f-Women/9-WomenHIV/9-women00.html	Summary of issues specific to HIV-infected women
The Body	http://www.thebody.com/whatis/women.shtml	Summary of issues specific to HIV-infected women
Primary HIV infection	http://aiedrp.fhcr.org	NIH Acute HIV Infection and Early Disease Research Program
Clinical, radiological, and microscopic images	http://members.xoom.it/AIDSimaging/contents.htm	Clinical, radiographic, and microscopic AIDS imaging (Italian and English)

expanded-access protocols of experimental drugs. The results of a search may differ between sites, and it is safest to search several until you are familiar with the different search parameters on each of these clinical trials sites.

The Canadian HIV Trials Network site contains a road map to ongoing and completed clinical trials in Canada. The Initio Trial site provides access to information on a large multicenter European study that is currently enrolling patients to compare different initial treatment protocols for previously untreated, HIV-infected individuals.

Patient-Oriented Sites

There are several excellent patient-oriented sites for lay readers that provide well-written reviews of HIV infection and its treatment (table 8). These sites also play an essential role in helping HIV-infected persons navigate the complex maze of health care in the United States in their efforts to obtain state-of-the-art medical and social services.

Aidsmap is a British site produced by the *National AIDS Manual* in collaboration with the British HIV Association and St. Stephen's AIDS Trust. It is both comprehensive and well-organized and has authoritative summaries of HIV that are written for lay persons but are also valuable to health professionals. The HIV ATIS, Project Inform, and Bulletin of Experimental Treatments for AIDS (BETA) sites contain excellent educational material. Materials on these sites are often more up-to-date than material on some of the larger sites belonging to this category. These sites also do a better job at distinguishing didactic material from editorial opinion.

Aegis began in 1990 as the HIV/AIDS bulletin board service (BBS). It now contains >100,000 on-line documents and links thousands of bulletin boards worldwide. Aegis contains extensive coverage of news via wire services, newspapers, patient-oriented newsletters, and physician-oriented review journals such as *AIDS Weekly Plus*, *Hopkins HIV Report*, and the *IA-PAC Journal*.

The "Insight from Experts" section is one of the strong points of the site named The Body. Users can post questions for one of several experts on topics such as HIV treatment, viral load and resistance testing, opportunistic infections, and lipodystrophy. The answers are usually direct yet appropriately conservative, considering the nature of the physician-patient interaction.

The National AIDS Treatment Advocacy Project (NATAP) Web site contains extensive summaries and sophisticated discussions of data presented at recent meetings. It is primarily targeted toward physicians and patients who are already very knowledgeable about HIV treatment.

Specialized Sites

Specialized sites (table 9) include CancerNet and OncoLink, which provide rich sources of information on HIV-related malignancies for both patients and physicians. HIVandhepatitis.com provides news items related to HIV, hepatitis C, and hepatitis B. It contains well-written reviews and editorials and background information on clinical issues pertaining to hepatitis B, hepatitis C, and coinfection with HIV. HIVresistance.com, contains a growing list of short, informal yet expertly written reviews of issues related to HIV drug resistance. The

test information section contains up-to-date information regarding HIV drug resistance assay development, regulatory status, reimbursement status, and referral information for resistance testing.

Many of the Web sites described in this article have sections devoted to HIV in women. Two of these are listed in table 9, but a more complete list can be found at <http://HIVInSite.ucsf.edu/topics/women>. The NIH maintains a site devoted to research on acute HIV infection. AIDSImaging is a site which publishes clinical, radiographic, and microscopic images of many of HIV's complications. Although many of the Web sites described in this article have sections devoted to lipodystrophy, we have not identified medical sites focusing primarily on the complications of anti-HIV therapy.

Conclusions

An enormous amount of effort has gone into placing medical and scientific information about HIV on the Web. We believe that this effort has not been wasted and that electronic access to education will play an increasingly important role in preventing and treating HIV infection throughout the world. However, as the amount of original HIV-related information on the Web increases, ongoing efforts will be needed to keep track of the most useful HIV Web sites.

In this article, we have reviewed only a small proportion of the Web sites related to HIV. Undoubtedly, we have left out a number of useful and important sites; however, the absence of a systematic approach for identifying and ranking Web sites makes this inevitable.

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