CURRENT REPORT—HIV

# Treatment of AIDS and HIV-Related Conditions—1999

*Ronald H. Goldschmidt, MD, and Betty J. Dong, PharmD*

During the last 2 years human immunodeficiency virus (HIV) disease and acquired immunodeficiency syndrome (AIDS) have been transformed from progressive, fatal diseases to ones in which the disease process can be improved. The striking effectiveness of combination antiretroviral therapy, especially regimens that include the protease inhibitor class of drugs, is largely responsible for this dramatic turnabout. Although some HIV-infected patients do not respond favorably to these therapies, and resistance to combination therapy can occur with time, there is now hope that if antiretroviral therapies continue to improve, HIV disease might eventually become another treatable chronic disease.

This Current Report — HIV updates our annual treatment guidelines.[1] It is based on a review of the medical literature, our experience at San Francisco General Hospital, and experience gained from answering calls to our National HIV Telephone Consultation Service (Warmline). These guidelines are intended to provide treatment recommendations for antiretroviral therapy and associated medical problems of adults and adolescents with HIV disease and AIDS.

## Antiretroviral Therapy

Guidelines for antiretroviral therapy are readily available. The United States Public Health Service publishes guidelines[2] that are updated continually at http://www.cdc.gov or http://hivatis.org. Recommendations from the International AIDS Society,[3] the British HIV Association,[4] and related articles add to the range of approaches to antiretroviral therapy.[5-8]

## Monitoring HIV Progression and Antiretroviral Therapy

Refinements in viral load testing have revolutionized HIV care. The ultrasensitive assays of HIV RNA (viral load) levels can detect fewer than 50 or even 20 copies/mL, allowing the clinician and patient to estimate activity of HIV disease and the degree of effectiveness of antiretroviral therapy. Although suppression of the viral load to less than the detectable level of the assay is the optimal goal of therapy, it is not always possible. Viral loads of less than about 500 copies/mL are desirable. Decreases in viral load generally occur within 1 month after therapy begins, but maximal suppression can take up to 4 to 6 months of therapy. Antiretroviral therapy that does not suppress the viral load by at least 1 log (10-fold) should be considered ineffective.

The CD4+ lymphocyte count remains an important surrogate marker in assessing HIV disease. Opportunistic infections rarely occur in patients with a CD4+ cell count of more than 200/μL, and the conditions associated with severe disease generally occur when the CD4+ cell count is less than 50 to 100/μL. The CD4+ count usually rises with effective antiretroviral therapy.

## Antiretroviral Drugs

The three principal classes of antiretroviral drugs (Table 1) are the nucleoside reverse transcriptase inhibitors (NRTIs), the protease inhibitors, and the nonnucleoside reverse transcriptase inhibitors (NNRTIs). Combination antiretroviral therapy is usually based upon a foundation of two NRTIs plus protease inhibitor therapy. Monotherapy is never recommended because drug resistance will develop rapidly.

The most common combinations of NRTIs are zidovudine plus lamivudine, didanosine, or

Submitted, revised, 3 September 1998.

From the Family Practice Residency Program, San Francisco General Hospital (RHG, BJD), and the Departments of Family and Community Medicine (RHG, BJD) and Clinical Pharmacy (BJD), University of California, San Francisco. Address reprint requests to Ronald H. Goldschmidt, MD, Family Practice Inpatient Service, San Francisco General Hospital, 1001 Potrero Ave, San Francisco, CA 94110. This article is also available at http://itsa.ucsf.edu/warmline.

Supported in part by the Pacific AIDS Education and Training Center, Grant No. 2 U69 PE00118-05, with the Bureau of Health Professions, Health Resources and Services Administration, Department of Health and Human Services.

zalcitabine; and stavudine plus lamivudine or didanosine. Zidovudine and stavudine should not be used together because antagonism can occur. Didanosine and zalcitabine should not be used together because of additive toxicity.

The protease inhibitor class of drugs[9] is most potent in decreasing viral load. When used in the absence of effective NRTI therapy, however, resistance usually occurs, rendering the protease inhibitors ineffective. Cross-resistance among protease inhibitors is common; when resistance develops to one protease inhibitor, resistance to other protease inhibitors can occur. Cross-resistance between ritonavir and indinavir is nearly 100 percent. Combination ritonavir plus saquinavir therapy can offer some benefits in persons who have protease inhibitor resistance to one other protease inhibitor. Protease inhibitors are associated with substantial side effects and important drug interactions, as listed in Table 1.

The NNRTIs can also be potent inhibitors of HIV replication. Without concomitant and effective NRTI therapy, however, the virus will rapidly develop complete resistance to NNRTI therapy. NNRTI resistance occurs across this class of drugs, so that resistance to one NNRTI results in resistance to the others. Currently, the most common role of the NNRTIs is to substitute for a protease inhibitor when toxicity or resistance to protease inhibitor therapy has occurred, but some providers use a combination of NRTIs plus protease inhibitor plus NNRTI as initial therapy or even NRTIs plus NNRTI as initial therapy. Long-term studies are needed to evaluate these strategies.

Hydroxyurea[10] has been used in combination with didanosine with apparent benefit in both early HIV infection and in salvage therapy. Whether hydroxyurea has long-term benefits and whether it is effective in combination with other antiretroviral agents remains unknown. The role of the nucleotide analog adefovir is unclear at this time. Adefovir has been used with apparent effectiveness as an additional agent in salvage therapy in patients who have failed other regimens.

Pseudo-Cushing syndrome, which includes the development of "buffalo hump," abnormal fat deposition, systemic dyslipidemias, and glucose intolerance and insulin resistance, has been described as a side effect of effective antiretroviral therapy.[11,12] These complications occur more commonly with combination therapy that includes protease inhibitors than with other combination regimens, but the syndrome also can occur in the absence of protease inhibitors. The pathophysiology of these side effects of therapy is not understood, although various hypotheses have been suggested.[11,13] It is possible that the renourishment of patients that results from effective combination antiretroviral therapy might be a cause of this syndrome.[11] These abnormalities are important for both cosmetic and possible long-term cardiovascular reasons.

## Initiating Antiretroviral Therapy

The optimal time to initiate antiretroviral therapy remains controversial.[2-4] The prevailing philosophy in the United States is to begin highly potent combination (three-drug) antiretroviral therapy as early as possible for patients with detectable virus who are prepared to commit to a lifetime of antiretroviral therapy. Reducing viral burden results in fewer infected cells, less immune system destruction, and decreased disease progression. By maximally suppressing viral replication, it is hoped that resistance to antiretroviral drugs will also be minimized. The Public Health Service recommends beginning therapy for patients with a CD4+ cell count of fewer than 500/μL or HIV RNA levels of greater than 10,000 copies/mL (bDNA assay) or 20,000 copies/mL (RT-PCR assay).[2] The International AIDS Society uses a threshold of 5000 to 10,000 copies/mL.[3] The British HIV Association Guidelines emphasize that therapy should be started before irreversible damage of the immune system has occurred, specifically at a CD4+ cell count of more than 350/μL.[4]

## Adherence

Close adherence to antiretroviral drug regimens is notoriously difficult, yet critical to treatment success. Interruption of therapy can result not only in ineffective therapy but in the rapid induction of drug resistance. Failure of early treatment can result in the emergence of a virus that is resistant not only to the drugs being taken but to that entire class of drugs. Second- or third-choice (salvage) regimens are generally less effective than initial regimens. The patient who is not prepared or cannot adhere to lifelong complicated medical regimens could be harmed, rather than helped, by initiation of combination antiretroviral therapy,[14] a fact that should weigh heavily on primary clinicians when recommending antiretroviral therapy,

especially for asymptomatic persons who have a low probability of developing AIDS within a few years. Although it is difficult for the clinician to withhold potentially beneficial therapy, in some cases this strategy can be the most prudent until the clinician and patient believe regimen adherence can be maintained.

## Changing Antiretroviral Regimens

Antiretroviral regimens are considered to be failed regimens if patients develop progressive opportunistic conditions of advancing AIDS, when the viral load increases substantially (at least 0.5 log), or when the CD4+ count falls. When the viral load has been undetectable, development of new detectable virus in the serum is also considered to be a sign of failed therapy. Long-term studies will be needed to determine the proper time to change therapy, as clinical improvement sometimes can be sustained beyond the time when surrogate markers (viral load and CD4+ count) deteriorate.

When changing antiretroviral drugs, at least two drugs should be changed. Optimally, an entirely new regimen with at least three new drugs is used.[2-4] When a protease inhibitor-containing regimen has failed, changing from that protease inhibitor to NNRTI therapy or possibly to combination protease inhibitor therapy (in addition to changing two NRTIs) is needed. Changing between ritonavir and indinavir and between the NNRTIs should be avoided because of cross-resistance.

## Effects of Antiretroviral Therapy on AIDS-Related Conditions

Effective antiretroviral therapy can have profound effects on AIDS-related conditions as well as the progression of HIV disease. Both the incidence and the natural history of such conditions as *Pneumocystis carinii* pneumonia, Kaposi sarcoma, cytomegalovirus disease, progressive multifocal leukoencephalopathy, mycobacterial disease, and AIDS dementia have been altered favorably by antiretroviral therapy.[15] With reconstitution of elements of the immune system, however, there are also reports of flare-ups of underlying disease[16] as the improved immune system stimulates a more vigorous response against these infections than had occurred during the more immune-depleted state. Although these flare-ups, such as retinitis and inflammatory responses to indolent mycobacterial disease, are usually temporary, clinicians will need to be alert to these unexpected manifestations.

Prophylaxis against opportunistic infections[17] remains a mainstay in HIV primary care. Most important is primary prophylaxis against *P carinii* pneumonia, which is recommended for all HIV-infected persons with symptomatic HIV disease or AIDS, including those with CD4+ cell counts of less than 200/μL. Prophylaxis against *Mycobacterium avium* complex (MAC) disease has been recommended after CD4+ cell counts decrease to less than 50/μL. Primary prophylaxis against candidal and other fungal diseases, herpes infections, and cytomegalovirus disease is not routinely recommended.

CD4+ count thresholds for opportunistic infection prophylaxis are based on the CD4+ count nadir. For patients whose CD4+ counts rise above those thresholds after initiation of antiretroviral therapy, prophylaxis against opportunistic infections usually should be continued. Studies are in progress to determine whether less intensive prophylaxis regimens might be adequate in persons receiving effective antiretroviral therapy. Some studies indicate these strategies can be effective.[18,19] Effective antiretroviral therapy will ultimately result in changes in recommendations for both primary prophylaxis and maintenance therapy after treatment of acute infections, but until more definitive long-term studies show that prophylaxis regimens can be altered, current recommendations should remain in effect.

## Tuberculosis

Tuberculosis prophylaxis is indicated for HIV-infected persons who have an induration of 5 mm or greater on the standard tuberculin skin test. Isoniazid prophylaxis does not require changing antiretroviral regimens, but the shorter rifampin- or rifabutin-based regimens require special drug-interaction considerations. In addition, treatment of active tuberculosis will result in potential drug interactions with antiretroviral medications. Consultation with a tuberculosis expert and adherence to new guidelines[20] can avoid serious treatment problems.

## The Table

Table 1 gives our recommendations for treating specific diseases and the major symptoms of HIV infection and AIDS. The recommendations are

*Text continued on page 93*

**Table 1. Treatment Regimens for HIV Disease**



| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC** | | | |
| **Antiretroviral (Anti-HIV)** | | | |
| *Combination therapies* | *Combination therapy is always recommended, as monotherapy is ineffective and promotes drug resistance. Most common regimens include two nucleoside reverse transcriptase inhibitors (NRTIs) along with protease inhibitor (PI) therapy. Nonnucleoside reverse transcriptase inhibitor (NNRTI) therapy can substitute for protease inhibitor therapy for patients who cannot take or are resistant to protease inhibitor therapy, or can be added to NRTI plus PI regimens when necessary. Cross-resistance among PIs is common, as is cross-resistance among NNRTIs. NRTI combinations are: zidovudine plus lamivudine, didanosine, or zalcitabine; or stavudine plus lamivudine or didanosine. Zidovudine and stavudine should not be used in combination. PI therapy is usually with nelfinavir, indinavir, ritonavir, saquinavir soft-gel capsules, or ritonavir plus saquinavir. Indinavir and saquinavir should not be used in combination. See text for further discussion.* | | |
| *Nucleoside reverse transcriptase inhibitors (NRTIs)* | | | |
| Zidovudine (AZT, Retrovir) 200 mg po tid or 300 mg po bid; lower dosages (eg, 100 mg 3 times daily) for patients unable to tolerate higher dosages and patients with renal failure or cirrhosis. Available as liquid formulation. Available also as fixed-dose combination (Combivir) consisting of zidovudine (300 mg) with lamivudine (150 mg) given as 1 capsule bid | Until efficacy wanes or toxicity occurs | Malaise, headache, nausea, insomnia, seizures, myalgias. Anemia, granulocytopenia, thrombocytopenia; macrocytosis is an expected effect of zidovudine therapy and requires no intervention. Toxic myopathy (with elevated creatine phosphokinase [CPK]) with long-term use. Lactic acidosis. Aminotransferase elevations (alanine transaminase [ALT], aspartate transaminase [AST]), hepatomegaly with steatosis. Blue to black discoloration of nails and skin in pigmented races<br><br>*Drug interactions*<br>Careful monitoring required when used with other myelosuppressive drugs (ie, trimethoprim-sulfamethoxazole, ganciclovir). Probenecid can increase levels of zidovudine. Acetaminophen (Tylenol) administration does not increase zidovudine toxicity | Monitor for signs of zidovudine toxicity and reduce dosage if required. Transfusions or erythropoietin (if endogenous erythropoietin level < 500 IU/L) therapy can be used if anemia (eg, hemoglobin < 8.0 g/dL) occurs in patients who require zidovudine therapy. Decrease dosage or interrupt for absolute neutrophil count (ANC) < 500/μL; consider granulocyte colony-stimulating factor (G-CSF). Transfusions and erythropoietin and G-CSF therapies are expensive; changing to alternate agent preferred<br><br>High-dosage (1200 mg po qd) zidovudine therapy can be considered for HIV dementia and thrombocytopenia. Toxicity of high-dosage zidovudine can be substantial |
| Didanosine (ddI, Videx) 200 mg po bid as 2 100-mg tablets or 250 mg po bid powder for patients > 60 kg; 125 mg (tablets) or 167 mg (powder) po bid for patients < 60 kg. Once-daily dosing (300 mg po qd) under investigation. Dosage reduction (ie, 200 mg/d) in renal failure | Until efficacy wanes or toxicity occurs | Pancreatitis; painful peripheral neuropathy (dosage related, reversible); nausea, abdominal cramps, diarrhea related to antacid in formulation; rash; hyperglycemia; hyperuricemia; aminotransferase elevations; headache, insomnia, seizures; elevated triglyceride and amylase levels; thrombocytopenia; retinal atrophy<br><br>*Drug interactions*<br>Concomitant administration of $H_2$ antagonists, antacids, and omeprazole (Prilosec) and other proton pump inhibitors can increase didanosine absorption, resulting in toxicity. Avoid alcohol and other pancreatic toxins (eg, systemic pentamidine). Avoid concomitant neurotoxic drugs (eg, zalcitabine, vinca alkaloids, oral ganciclovir). Decreases absorption of drugs whose absorption is impaired by buffered products (eg, ketoconazole, itraconazole, indinavir, delavirdine, ritonavir, tetracyclines, quinolone antibiotics). Oral and intravenous ganciclovir increase didanosine toxicity | Monitor for signs of neuropathy. Two tablets must be given per dose to provide adequate buffer for absorption. Can be difficult to chew; tablets do not dissolve readily in water, can be crushed manually<br><br>Administer didanosine on empty stomach 2 hours apart from antacids, $H_2$ antagonists, and drugs (eg, ketoconazole, itraconazole, indinavir, ritonavir, tetracyclines, delavirdine, quinolone antibiotics) whose absorption is impaired by buffered products |

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC** | | | |
| **Antiretroviral (Anti-HIV) (cont.)** | | | |
| Zalcitabine (ddC, Hivid) 0.75 mg po tid; 0.375 mg po tid for patients < 30 kg. Dosage reduction in renal failure | Until efficacy wanes or toxicity occurs | Painful peripheral neuropathy (dosage related, reversible); rash; stomatitis, aphthous ulcers; pancreatitis; esophageal ulceration; seizures; aminotransferase elevations; cardiomyopathy<br><br>*Drug interactions*<br>Avoid alcohol and other pancreatic toxins (eg, systemic pentamidine). Avoid concomitant neurotoxic drugs (eg, didanosine, stavudine, isoniazid, vinca alkaloids, oral ganciclovir) | Zalcitabine might be less potent than other NRTIs |
| Stavudine (d4T, Zerit) 20 - 40 mg po bid for patients > 60 kg; 15 - 30 mg po bid for patients 40 - 60 kg; reduce dosage for patients < 40 kg and for patients with renal failure. Available as liquid formulation | Until efficacy wanes or toxicity occurs | Painful peripheral neuropathy; aminotransferase elevations; anemia, macrocytosis; psychological disturbances, insomnia, anxiety, panic attacks<br><br>*Drug interactions*<br>Avoid concomitant use of drugs that can cause neurotoxicity or pancreatic toxicity. See didanosine | Dosage range in this table is lower than standard dosage (40 mg po bid), as studies suggest these lower dosages are associated with equivalent efficacy and a lower incidence of peripheral neuropathy<br><br>Do not use in combination with zidovudine |
| Lamivudine (3TC, Epivir) 150 mg po bid; 2 mg/kg po bid for patients < 50 kg. Dosage reduction in renal failure. Available as liquid formulation. Available also as fixed dose combination (Combivir) consisting of zidovudine (300 mg) with lamivudine (150 mg) given as 1 capsule bid | Until efficacy wanes or toxicity occurs | Headache, fatigue, insomnia; peripheral neuropathy, muscle aches; rash; aphthous ulcers; nausea; rare neutropenia, thrombocytopenia; paronychia | Provides some efficacy against hepatitis B. Once-daily dosing (300 mg po qd) under investigation |
| Abacavir (1592U89, Ziagen) 300 mg po bid with or without food | Until efficacy wanes or toxicity occurs | Nausea, headache, malaise; abdominal pain, diarrhea, rash. Hypersensitivity reaction (2% - 5%, usually in first 4 weeks): flu-like symptoms, fever, malaise, abdominal cramping, nausea, vomiting, diarrhea, morbilliform rash, elevations in transaminases and creatine kinase levels. Symptoms resolve if drug stopped. Do not rechallenge, as anaphylactic reactions and deaths reported | |
| *Protease inhibitors (PIs)* | | | |
| Nelfinavir (Viracept) 750 mg po tid with meals or 1250 mg po bid with meals. Available as liquid formulation | Until efficacy wanes or toxicity occurs | Diarrhea; hypertriglyceridemia; hypercholesterolemia, abnormal fat accumulation, hyperglycemia<br><br>*Drug interactions*<br>P-450 enzyme inhibitor. Avoid concomitant use with rifampin, rifabutin (or decrease rifabutin dosage to 150 mg po qd), astemizole, terfenadine, and cisapride. Benzodiazepine interactions under investigation. Avoid simvastatin or lovastatin because of rhabdomyolysis; can use pravastatin or fluvastatin | Resistance develops slowly; resistant strains might be sensitive to other PIs |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC**<br>**Antiretroviral (Anti-HIV) (cont.)** | | | |
| Indinavir (Crixivan) 800 mg po q 8 h on empty stomach or with skim milk, juice, coffee, tea, toast; dosage adjustment to 600 mg po q 8 h in hepatic disease | Until efficacy wanes or toxicity occurs | Nephrolithiasis, crystalluria, interstitial nephritis; hypertriglyceridemia, hypercholesterolemia, abnormal fat accumulation, hyperglycemia; nausea, vomiting, diarrhea, abdominal pain; asymptomatic hyperbilirubinemia, aminotransferase elevations; rash; insomnia, headache, dizziness, taste disturbances; thrombocytopenia<br><br>*Drug interactions*<br>Avoid concomitant use of indinavir with rifampin, rifabutin (or decrease rifabutin dosage to 150 mg po qod), astemizole (Hismanal), cisapride (Propulsid), triazolam (Halcion), or midazolam (Versed). Decrease indinavir dosage to 600 mg po q 8 h when given with ketoconazole or delavirdine. Indinavir administration must be at least 1 hour apart from didanosine or antacid administration. Avoid simvastatin or lovastatin because of rhabdomyolysis; can use pravastatin or fluvastatin | Take with at least 6 glasses of noncaffeinated liquid daily to avoid nephrolithiasis<br><br>Must be taken every 8 hours, not 3 times daily |
| Ritonavir (Norvir) 600 mg po bid with meals; can increase from 300 mg po bid to 600 mg po bid over 4 - 7 days to minimize gastrointestinal symptoms. Available as liquid formulation. Combination PI therapy with saquinavir permits lower dosages of each (see below) | Until efficacy wanes or toxicity occurs | Nausea, vomiting, diarrhea, anorexia in more than 50% of patients; aminotransferase elevations; hypertriglyceridemia, hypercholesterolemia, abnormal fat accumulation, hyperglycemia; fatigue, weakness, headache, dizziness, circumoral paresthesias; hyperuricemia, increased creatine kinase; taste disturbances<br><br>*Drug interactions*<br>Potent hepatic P-450 enzyme inhibitor. Avoid concomitant use with rifampin, rifabutin (or decrease rifabutin dosage to 150 mg po qod), astemizole, cisapride, and benzodiazepines except lorazepam and temazepam. Dosages of desipramine and other antidepressants, narcotics, and oral contraceptives might need adjustment. Avoid simvastatin or lovastatin because of rhabdomyolysis; can use pravastatin or fluvastatin | Capsules must be refrigerated; solution is stable at room temperature for 30 days |
| Saquinavir soft-gel capsules (Fortovase) 1200 mg po tid with meals Combination PI therapy with ritonavir permits lower dosages of each (see below) | Until efficacy wanes or toxicity occurs | Headache, confusion; hypertriglyceridemia, hypercholesterolemia, abnormal fat accumulation, hyperglycemia; nausea diarrhea, abdominal pain; fever<br><br>*Drug interactions*<br>Ketoconazole, ritonavir, delavirdine, and grapefruit juice increase saquinavir serum concentration. Avoid concomitant use of saquinavir with indinavir, rifampin, rifabutin, phenytoin, carbamazepine, phenobarbital, efavirenz, dexamethasone, nevirapine, and other enzyme inducers. Avoid simvastatin or lovastatin because of rhabdomyolysis; can use pravastatin or fluvastatin | Hard-gel formulation (Invirase, 600 mg po tid within 2 hours of a high-fat meal to increase absorption); not recomended because of poor bioavailability (4%), even when taken with high-fat meal |

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC** | | | |
| **Antiretroviral (Anti-HIV) (cont.)** | | | |
| Ritonavir 400 - 600 mg po bid<br><br>plus<br><br>Saquinavir soft-gel capsules 400 - 600 mg po bid. Lower dosages (400 mg of each) preferred | Until efficacy wanes or toxicity occurs | See individual agents | Generally well tolerated<br><br>Combination therapy provides higher saquinavir levels |
| Nelfinavir 750 mg po tid<br><br>plus<br><br>Saquinavir 800 mg po tid | Until efficacy wanes or toxicity occurs | See individual agents | Generally well tolerated<br><br>Combination therapy provides higher saquinavir levels |
| Amprenavir (141W94, Agenerase) 1200 mg po bid with or without food | Until efficacy wanes or toxicity occurs | Nausea, diarrhea; hypertriglyceridemia, hypercholesterolemia, abnormal fat accumulation, hyperglycemia; headache; rash, Stevens-Johnson syndrome<br><br>*Drug interactions*<br>Metabolized by P-450 system; drug interactions (eg, rifampin, rifabutin) expected. Avoid simvastatin or lovastatin because of rhabdomyolysis; can use pravastatin or fluvastatin | Approval expected during 1999 |
| *Nonnucleoside reverse transcriptase inhibitors (NNRTIs)* | | | |
| Nevirapine (Viramune) 200 mg po qd for 14 days; if no rash develops, increase to 200 mg po bid. Once-daily dosing (400 mg po qd) under investigation. | Until efficacy wanes or toxicity occurs | Maculopapular rash, Stevens-Johnson syndrome; nausea, vomiting, diarrhea; fatigue, fever, headaches; aminotransferase elevations; rare hematologic toxicity<br><br>*Drug interactions*<br>P-450 enzyme inducer; avoid concomitant use with saquinavir, rifampin, and rifabutin | Discontinue drug at any time if rash is severe. Do not increase dosage if any rash is present during first 14-day lead-in period<br><br>Rash from one NNRTI does not predict rash from other NNRTIs |
| Delavirdine (Rescriptor) 400 mg po tid. Can dissolve in 3 oz water as slurry | Until efficacy wanes or toxicity occurs | Maculopapular rash; nausea; headache; aminotransferase elevations especially when taken with saquinavir; neutropenia when taken with nelfinavir<br><br>*Drug interactions*<br>P-450 enzyme inhibitor. Avoid concomitant use of astemizole, rifampin, rifabutin, phenytoin, carbamazepine, cisapride, alprazolam, midazolam, triazolam, ergot alkaloids. Ketoconazole, itraconazole, fluconazole, clarithromycin, and fluoxetine can increase delavirdine serum concentrations; dosage reduction might be necessary | Delavirdine increases saquinavir and indinavir levels by 50%. Reduce indinavir dosage to 600 mg po q 8 h when used in combination with delavirdine. Separate didanosine or antacid administration from delavirdine administration by at least 1 hour<br><br>Rash from one NNRTI does not predict rash from other NNRTIs |
| Efavirenz (DMP 266, Sustiva) 600 mg po qhs with or without food; 200 mg po tid if dizziness occurs | Until efficacy wanes or toxicity occurs | Dizziness, anxiety, inability to concentrate, lightheadedness, headache dysphoria, nightmares; nausea; rash (less than other NNRTIs). Avoid in pregnancy<br><br>*Drug interactions*<br>Avoid use with saquinavir, astemizole, and cisapride. Increased indinavir dosage to 1 g po q 8 h might be required | Good central nervous system penetration; resistance might develop more slowly than other NNRTIs.<br><br>Rash from one NNRTI does not predict rash from other NNRTIs |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC**<br>**Antiretroviral (Anti-HIV) (cont.)** | | | |
| *Other Agents* | | | |
| Hydroxyurea (Hydrea) 500 mg po bid | Until efficacy wanes or toxicity occurs | Bone marrow suppression including CD4+ count decline during hydroxyurea therapy | Can be used in combination with didanosine (and possibly other antiretroviral drugs) as salvage therapy. Long-term risks and benefits unknown |
| Adefovir dipivoxil (bis-POM PMEA, Preveon) 120 mg po qd; lower dosage (60 mg po qd) might be effective | | Nausea, vomiting, diarrhea, aminotransferase elevations; malaise; renal insufficiency, Fanconi-like syndrome with hypophosphatemia, glycosuria, renal acidosis, proteinuria, and elevated serum creatinine<br><br>*Drug interactions*<br>Avoid concurrent use with other nephrotoxins | Nucleotide analog. Role unclear at this time; might offer benefit in salvage therapy. Carnitine supplementation might be required. Approval expected during 1998. Available through expanded access at 1-800-445-3235 |
| *Postexposure prophylaxis* | | | |
| Zidovudine 200 mg po tid plus lamivudine 150 mg po bid with or without nelfinavir 750 mg po tid or indinavir 800 mg po q 8 h | 4 weeks | See above adverse effects and drug interactions. Zidovudine and lamivudine appear to be safe in pregnancy | Administration within 1 - 2 hours or as soon as possible after exposure. Can substitute other antiretroviral agents (eg, stavudine plus didanosine) when source patient has received extensive treatment with zidovudine or lamivudine. Add nelfinavir, indinavir, or other PI for high-risk exposures and when source patient suspected to have developed antiretroviral drug resistance. Can call 1-888-HIV-4911 for additional assistance |
| *Pregnancy* | | | |
| Zidovudine-containing antiretroviral regimen during pregnancy, plus intrapartum zidovudine 2 mg/kg IV for 1 hour, then 1 mg/kg/h until delivery | Until end of pregnancy | See above adverse effects and drug interactions<br><br>Serious adverse effects on fetus not found in studies to date | Zidovudine therapy, combined with intrapartum intravenous zidovudine plus oral zidovudine 2 mg/kg qid to infants for first 6 weeks of life, decreases transmission to infants<br><br>Unconfirmed reports of premature deliveries when PI therapy is used |
| **Wasting Syndrome** | | | |
| Megestrol (Megace) suspension (40 mg/mL) 800 mg po qd | Indefinitely | Nausea, vomiting; edema; adrenal suppression; depression. Progestin side effects (hyperglycemia, decreased testosterone levels) | Megestrol can increase appetite and cause fat accumulation with weight gain. Uncertain whether this weight gain improves health. Available also as tablets, but large number of tablets required for administration and more expensive |
| Dronabinol (Tetrahydro-cannabinol [THC], Marinol) 2.5 mg po bid 30 minutes to 1 hour before meals. Maximum 20 mg qd | Indefinitely | Restlessness, irritability, insomnia, dizziness, loss of coordination, psychotomimetic effects; fatigue; tachycardia | Increases appetite and can cause weight gain. Uncertain whether this weight gain improves health. Antinauseant. Not recommended for persons sensitive to marijuana effects |
| Human growth hormone (r-hGH, Serostim) 0.1 mg/kg/d SQ (average dosage 6 mg/d) | Unknown | Arthralgias, joint stiffness, carpal tunnel syndrome; hyperglycemia; hypertriglyceridemia | Can improve exercise endurance and increase weight, characterized by increased lean body mass and decreased fat |
| Anabolic steroids (eg, testosterone 200 mg IM every 2 weeks or 300 mg IM every 3 weeks, oxandrolone [Oxandrin] 2.5 mg po bid - tid or testosterone patches [Testoderm, Androderm]) | Unknown | Edema; cholestatic jaundice, peliosis hepatis, aminotransferase elevations; increased libido, testicular atrophy, priapism; insomnia | Might improve well-being and increase lean body mass. Treatment should be accompanied by exercise |

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC** | | | |
| ***Mycobacterium avium* complex (MAC)** | | | |
| *Prophylaxis* | | | |
| Clarithromycin (Biaxin) 500 mg po bid | Indefinitely | Clarithromycin and azithromycin side effects include nausea, vomiting, dyspepsia, diarrhea, hearing loss, aminotransferase elevations | Survival benefits shown for clarithromycin. Prophylaxis can be offered to patients with CD4+ cell counts < 50/μL |
| OR | | | |
| Azithromycin (Zithromax) 1200 mg po once weekly or 500 mg po qd | Indefinitely | *Drug interactions*<br>Clarithromycin increases serum levels of rifabutin and can lead to rifabutin toxicity, including severe anterior uveitis. Clarithromycin and azithromycin increase levels of carbamazepine and theophylline. Avoid astemizole in combination with azole antibiotics because of increased risk of torsades de pointes and ventricular tachyarrhythmias | Clarithromycin and rifabutin might pro vide prophylaxis against *Cryptosporidium* |
| OR | | | |
| Rifabutin (Mycobutin) 300 mg po qd | Indefinitely | Nausea (can be reduced by administering 150 mg po bid). Rash. Uveitis with dosages > 300 mg po qd and in patients receiving concomitant clarithromycin, fluconazole, or indinavir therapy. Red-orange discoloration of body fluids. Rare neutropenia, thrombocytopenia, anemia; flu-like syndrome; elevated bilirubin and alkaline phosphatase levels, hepatitis<br><br>*Drug interactions*<br>Multiple interactions with protease inhibitors (see Antiretroviral drugs, above). Rifabutin increases metabolism of methadone, zidovudine, and clarithromycin; higher dosage of these drugs might be required. Clarithromycin increases rifabutin blood levels and can lead to rifabutin toxicity | Exclude *Mycobacterium tuberculosis* infection before initiating rifabutin therapy |
| *Acute MAC disease* | | | |
| Ethambutol (Myambutol) 15 mg/kg po qd (1 g po qd maximum); dosage reduction in renal failure | Indefinitely, if tolerated (minimum of 12 weeks) | Optic neuritis (if > 25 mg/kg/d); hyperuricemia; nausea, vomiting | Treatment indicated for documented MAC disease and patients with progressive signs, symptoms, and laboratory abnormalities consistent with MAC disease. Clinical improvement might take 2 - 4 weeks. Isolation of MAC in stool or sputum might not indicate systemic disease but is usually treated with ethambutol plus a macrolide antibiotic |
| plus either | | | |
| Clarithromycin 500 mg po bid. Higher dosages associated with higher mortality | | | When both *M tuberculosis* and MAC infections are suspected, add isoniazid, rifampin, and pyrazinamide to ethambutol and clarithromycin pending culture results. See *M tuberculosis* |
| or | | | |
| Azithromycin 500 mg po qd | | | |
| *For serious illness or failure to respond within 1 month, can add one or two of the following:* | | | |
| Rifabutin 300 mg po qd | Indefinitely | | Rifampin (Rimactane, Rifadin) 450 - 600 mg po qd can be substituted for rifabutin if concerned about *M tuberculosis* |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC** | | | |
| ***Mycobacterium avium* complex (MAC) (cont.)** | | | |
| Ciprofloxacin (Cipro) 500 - 750 mg po qd - bid | Indefinitely | Nausea, vomiting, diarrhea. Reversible pink to brown-black discoloration of skin, eyes, body secretions; rash. Hyperglycemia. Retinal degeneration<br><br>*Drug interactions*<br>Binds to cations, resulting in decreased ciprofloxacin absorption. Administer 2 - 4 hours after antacids, sucralfate, dairy products, and didanosine | |
| Amikacin (Amikin) 7.5 - 10.0 mg/kg IM/IV qd | 2 - 8 weeks | Nephrotoxicity, ototoxicity | Monitor drug levels in patients with renal failure |
| ***Mycobacterium tuberculosis*** | | | |
| *Prophylaxis* | | | |
| Isoniazid (INH) 300 mg po qd | 6 - 12 months | Aminotransferase elevations and hepatitis; administer with pyridoxine to prevent peripheral neuropathy<br><br>*Drug interactions*<br>Increases metabolism of ketoconazole; larger dosages of ketoconazole might be required. Increased phenytoin and carbamazepine toxicity; monitor levels | Prophylaxis for all HIV-infected persons with ≥ 5-mm intermediate-strength tuberculin skin test induration and those with strong history of tuberculosis exposure regardless of skin test reactivity<br><br>Isoniazid can be administered concurrently with NRTIs, PIs, NNRTIs |
| OR | | | |
| Rifampin or rifabutin<br><br>plus<br><br>Pyrazinamide or isoniazid | 2 - 3 months | See individual drug toxicities<br><br>*Drug interactions*<br>PIs should not be administered concurrently with rifampin. Rifabutin contraindicated with ritonavir, soft-gel saquinavir, delavirdine, and possibly other antiretroviral drugs | When short-course prophylaxis is administered with or without directly observed therapy (DOT), consultation with tuberculosis experts is recommended. Effective antiretroviral therapy should not be discontinued to permit use of specific antituberculosis drugs |
| *Active tuberculosis* | | | |
| Combinations of isoniazid, rifampin or rifabutin, pyrazinamide, ethambutol, and streptomycin | Begin with 4 drugs. After 2 months can usually continue 2-drug therapy, depending upon susceptibility testing results. Total treatment: at least 6 months, and 6 months beyond culture conversion | See individual drug adverse effects and drug interactions<br><br>*Drug interactions*<br>PIs should not be administered concurrently with rifampin. Rifabutin contraindicated with ritonavir, soft-gel saquinavir, delavirdine, and possibly other antiretroviral drugs | Consultation with tuberculosis experts required. Treatment guidelines available through Centers for Disease Control and Prevention at http://www.cdc.gov |
| **Histoplasmosis** | | | |
| *Acute* | | | |
| Amphotericin B (Fungizone) 1.0 mg/kg IV qd until 15 mg/kg total dosage has been administered. Decrease to 0.7 - 0.8 mg/kg qd if not tolerated | 6 - 8 weeks total acute therapy (amphotericin plus itraconazole) | See CENTRAL NERVOUS SYSTEM, *Cryptococcus neoformans* | Amphotericin B recommended initially; oral therapy does not appear as effective. Itraconazole 200 mg po bid might be effective |
| followed by | | | |
| Itraconazole (Sporanox) 200 mg po bid | See above | Nausea, vomiting; hypokalemia; hypertension; aminotransferase elevations; adrenal insufficiency; rhabdomyolysis. | Teratogenic |

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GENERAL/SYSTEMIC** | | | |
| **Histoplasmosis (cont.)** | | | |
| Itraconazole (cont.) | | *Drug interactions*<br>Potent hepatic enzyme inducers, such as rifampin and phenytoin, increase metabolism of itraconazole; higher itraconazole dosages might be required. Avoid concurrent use with triazolam, alprazolam (Xanax), antacids, $H_2$ blockers, and omeprazole | |
| *Maintenance* | | | |
| Itraconazole 200 mg po qd | Indefinitely | | Fluconazole 400 mg po qd less effective |
| OR | | | |
| Amphotericin B 50 mg IV each week, 2 times a week, or every other week | Indefinitely | | Optimum frequency of administration not determined |
| **Coccidioidomycosis** | | | |
| *Acute* | | | |
| Amphotericin B (as above) | 6 - 8 weeks | See CENTRAL NERVOUS SYSTEM *Cryptococcus neoformans* | Fluconazole penetrates CNS and is preferred initial therapy for CNS coccidioidomycosis |
| or | | | |
| Fluconazole | Indefinitely | | |
| *Maintenance* | | | |
| Fluconazole | Indefinitely | | |
| **Cryptococcosis** | | See CENTRAL NERVOUS SYSTEM, *Cryptococcus neoformans* | |
| **SKIN/MUCOCUTANEOUS** | | | |
| **Kaposi sarcoma** | | | |
| Observation | Indefinitely | | Treatment not required unless lesions are symptomatic or cosmetically bothersome |
| OR | | | |
| Local treatment (radiation therapy, cryotherapy, excision, or intralesional vinblastine) | Until lesions and symptoms are resolved or controlled | Mucositis in head and neck regions from radiation therapy | Treatment effective for cosmetic purposes, for relief of symptoms, and to help reduce edema caused by lymphatic obstruction |
| OR | | | |
| Systemic chemotherapy with vinblastine and vincristine, vincristine alone, or combination of doxorubicin, bleomycin, and vincristine | Same | Usual chemotherapeutic agent side effects. Liposomal preparations might have some advantages in specific cases | Therapy can help control disease but does not alter prognosis. Consultation by oncologist or AIDS specialist usually required |
| OR | | | |
| Interferon-alpha 3 mU SQ 3 times weekly; increase by 3 mU/d every 2 weeks as tolerated (maximum 27 mU/d) | Indefinitely | Fatigue, myalgia, asthenia; neutropenia, thrombocytopenia; aminotransferase elevations | Hematologic toxicities increased in patients taking zidovudine. Dosages greater than 10 mU/d necessary for efficacy |
| **Seborrheic dermatitis** | | | |
| Hydrocortisone (HC) cream 2.5% plus ketoconazole cream 2% bid; severe cases can require ketoconazole 200 - 400 mg po qd for 3 - 4 weeks | Until resolved | See ORAL CAVITY, *Candida albicans*, ketoconazole | Commonly involves face, eyebrows, retroauricular areas, nasolabial folds, and scalp. Addition of antifungal cream enhances therapeutic response and reduces the frequency of steroid application |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **SKIN/MUCOCUTANEOUS (cont.)** | | | |
| **Mucocutaneous herpes simplex** | | | |
| *Acute* | | | |
| Acyclovir (Zovirax) 200 mg po 5 times a day or 400 mg po tid | 7 - 10 days | Oral: nausea, vomiting, diarrhea, dizziness | Topical acyclovir ineffective for most episodes |
| OR | | | |
| Valacyclovir (Valtrex) 500 mg - 1g po bid | 10 days | Nausea, vomiting, diarrhea; headache, dizziness, fatigue, insomnia. Hemolytic uremic syndrome (if > 3 g/d) | |
| OR | | | |
| Famciclovir (Famvir) 250 mg po tid | 10 days | Nausea, vomiting, diarrhea; headache, dizziness, fatigue, insomnia | |
| *Maintenance* | | | |
| Acyclovir 200 - 400 mg po 2 - 3 times a day or valacyclovir 500 mg po bid or 1 g po qd or famciclovir 250 mg po bid | Indefinitely | | Chronic maintenance therapy might be necessary for repeated episodes |
| **Disseminated, extensive, or persistent herpes simplex** | | | |
| Acyclovir 5 mg/kg/dose IV q 8 h; dosage reduction in renal failure; maintenance as above | 7 - 14 days or until lesions resolve | Intravenous: lethargy, tremors, confusion, hallucinations; phlebitis; increased serum creatinine, reversible crystalline nephropathy | Severe herpes infections (eg, esophagitis, colitis, encephalitis) require intravenous acyclovir. Maintain good urine output and hydration to prevent acyclovir crystallization |
| OR | | | |
| Valacyclovir 1 g po tid | 7 - 14 days or until lesions resolve | See above | |
| **Herpes zoster (shingles, disseminated, or persistent zoster)** | | | |
| Acyclovir 10 mg/kg/dose IV q 8 h; or acyclovir 800 mg po 5 times a day; reduce dosage of intravenous acyclovir in renal failure | 7 - 10 days or until lesions resolve | | Alternate drugs are foscarnet, vidarabine, cidofovir, and trifluridine (Viroptic) applied to skin covered with polymyxin B-bacitracin (Polysporin) ointment q 8 h. Keratoconjunctivitis requires more frequent (q 2 h) trifluridine application |
| OR | | | |
| Valacyclovir 1 g po tid | 7 - 10 days | | |
| **Acyclovir-resistant herpes infections** | | | |
| Foscarnet 40 mg/kg/dose IV q 8 h; dosage reduction in renal failure | 10 - 14 days or until lesions clear | See OPHTHALMOLOGIC, CMV, below | See OPHTHALMOLOGIC, CMV, below |
| OR | | | |
| Trifluridine (Viroptic) 1% solution q 8 h | Same | Rare hypersensitivity reactions | Apply to affected areas and cover with antibiotic ointment such as bacitracin or polymyxin B<br><br>Keratoconjunctivitis requires more frequent (as often as 2 hours, maximum 9 drops a day) trifluridine application |
| Cidofovir | Same | See OPHTHALMOLOGIC, CMV, below | Cidofovir might be effective |

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **SKIN/MUCOCUTANEOUS (cont.)** | | | |
| **Bacillary angiomatosis** | | | |
| Erythromycin 500 mg po qid | 2 months | See GENERAL/SYSTEMIC, MAC, clarithromycin, azithromycin. Jarisch-Herxheimer reaction with systemic disease | Skin lesions can resolve in 1 - 3 weeks, but 2 months' treatment needed. Systemic disease (eg, hepatic, splenic, central nervous system, bone) or cutaneous recurrences require treatment for 4 months or indefinitely. Azithromycin 1 g po qd and clarithromycin 500 - 1000 mg po qd can be used as alternatives |
| OR | | | |
| Doxycycline 100 mg po bid | 2 months | | |
| **Eosinophilic folliculitis** | | | |
| High-potency fluorinated corticosteroid cream bid | Indefinitely | | Itraconazole 200 mg po once daily with food might be effective. If no response in 2 weeks, increase dosage to 200 mg po bid for 2 additional weeks. If no response after 4 weeks, discontinue. Topical metronidazole might be helpful |
| plus | | | |
| Antihistamine (eg, diphenhydramine [Benadryl], hydroxyzine [Atarax, Vistaril], doxepin [Sinequan]) | Indefinitely | | Avoid astemizole in combination with azole antibiotics because of increased risk of torsades de pointes and ventricular tachyarrhythmias |
| **HEMATOLOGIC** | | | |
| **Thrombocytopenia** | | | |
| Observation | | Discontinue drugs that can cause thrombocytopenia<br><br>Corticosteroids can increase immunodeficiency | Treatment not required in absence of bleeding. Consider platelet transfusions prior to invasive procedures. High-dosage zidovudine, corticosteroids (eg, prednisone 60 mg po qd), splenectomy, intravenous gamma globulin, and interferon-alpha can raise platelet count |
| **OPHTHALMOLOGIC** | | | |
| **Cytomegalovirus (CMV)** | | | |
| *Prophylaxis* | | | |
| Ganciclovir (Cytovene) 1 g po tid | Indefinitely | See below | Oral ganciclovir primary prophylaxis is not currently recommended. Efficacy not established |
| *Acute retinitis* | | | |
| *Induction* | | | |
| Ganciclovir 5 mg/kg/dose IV q 12 h; dosage reduction in renal failure | 14 days for acute retinal infection: 14 - 21 days usually required for extraocular infection | Neutropenia, leukopenia, anemia, thrombocytopenia (avoid if platelet count < 20,000/μL); aminotransferase elevations; renal failure; phlebitis, rash; nausea. Discontinue zidovudine during induction to minimize additive hematologic toxicity (neutropenia). To avoid hematologic toxicity, substitute didanosine, zalcitabine, or stavudine for zidovudine, or change to foscarnet | Intravitreal ganciclovir by injection or implant appears effective if IV causes unacceptable toxicity. Does not provide systemic therapeutic effect or protection of contralateral eye<br><br>Start G-CSF (Filgrastim, Neupogen) 300 μg SQ qd to 3 times a week for ganciclovir-induced neutropenia (ANC < 500/μL) on two consecutive measurements |
| OR | | | |
| Foscarnet (Foscavir) 90 mg/kg/dose IV q 12 h as 2-hour infusion, dosage discontinuation or reduction in renal failure | 14-day induction | Nephrotoxicity common; tremors, headaches, occasional seizures, muscle spasms; hypocalcemia, hypercalcemia, hypokalemia, hypophosphatemia, hyperphosphatemia; anemia, granulocytopenia; aminotransferase elevations; phlebitis, penile ulcerations<br><br>*Drug interactions*<br>Avoid concurrent use of nephrotoxic agents when possible | Administered by infusion pump via central line. Infusion of 500 - 1000 mL normal saline before each foscarnet administration can minimize nephrotoxicity. Creatinine clearance should be measured in cachectic patients and in patients with renal insufficiency to ensure proper use of administration nomogram |
| OR | | | |
| Ganciclovir plus foscarnet | | See individual agents above | Continue maintenance drug, induce with the alternative drug, then continue maintenance therapy with both drugs |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **OPHTHALMOLOGIC** | | | |
| **Cytomegalovirus (CMV) (cont.)** | | | |
| *Alternatives to ganciclovir or foscarnet* | | | |
| Cidofovir (Vistide) 5 mg/kg IV with probenecid (2 g po 3 hours before and 1 g po 2 and 8 hours after infusion) each week for 2 weeks, then every 2 weeks thereafter; contraindicated in renal insufficiency (serum creatinine ≥ 1.5/mg/dL, CrCl ≤ 55 mL/min, 2+ proteinuria) | 14-day induction period | Life-threatening nephrotoxicity; fever; nausea, diarrhea; rash; uveitis, iritis, ocular hypotonia; proteinuria, metabolic acidosis; neutropenia. Persons allergic to sulfa compounds can be allergic to probenecid<br><br>*Drug interactions*<br>Avoid concomitant administration with any potentially nephrotoxic agent, including nonsteroidal anti-inflammatory drugs | Not known whether cidofovir is as effective as ganciclovir or foscarnet. Indwelling catheter not required<br><br>Prehydrate with 1 L normal saline. Do not administer within 7 days of other potentially nephrotoxic agents. Patients previously treated with foscarnet are at increased risk for renal failure. Administer G-CSF if ANC consistently < 500/μL |
| OR | | | |
| Ganciclovir implant (Vitasert)<br><br>plus | Indefinitely | Implant can cause transient visual deterioration, retinal detachment, vitreal hemorrhage, cataracts, and endophthalmitis | Implant ideal for patients unable to take daily intravenous therapy. Combine with oral ganciclovir to provide protection against systemic disease and contralateral eye involvement |
| Ganciclovir 1g po tid | | Oral ganciclovir: Anemia, neutropenia; nephrotoxicity; neuropathy<br><br>*Drug interactions*<br>Oral ganciclovir therapy causes 50% increase in didanosine blood levels; reduce didanosine dosage by 50% | Oral ganciclovir absorption is erratic when diarrhea is present. Administer on empty stomach to improve absorption |
| *Maintenance* | | | |
| Ganciclovir 5 mg/kg IV qd as 1-hour infusion; dosage reduction in renal failure | Indefinitely | | Lifelong suppressive therapy required to prevent recurrence of retinitis. Less frequent (5 - 6 days per week) administration might be acceptable. Administer G-CSF or change to foscarnet if ANC consistently < 500/μL |
| OR | | | |
| Foscarnet 90 mg/kg IV qd as 2-hour infusion; discontinuation or dosage reduction in renal failure | Indefinitely | | Maintenance with 120 mg/kg/d might be more effective but also more toxic |
| OR | | | |
| Ganciclovir plus foscarnet<br><br>OR | Indefinitely | See individual agents above | Combination therapy not routinely recommended as initial therapy. Continue maintenance dosage of current drug; induce alternate drug, followed by maintenance with both drugs. Reinduction with ganciclovir or foscarnet might be helpful for recurrences when alternative drug cannot be administered |
| Ganciclovir 1 g po tid | Indefinitely | See above | Oral ganciclovir is not as effective for maintenance therapy as other regimens |
| OR | | | |
| Cidofovir 5 mg/kg as 1-hour infusion every 2 weeks at infusion center | Indefinitely | Life-threatening nephrotoxicity; cannot be given with potentially nephrotoxic drugs | Does not require indwelling catheter; quality of life might be improved |
| **ORAL CAVITY** | | | |
| ***Candida albicans*** | | | |
| Clotrimazole (Mycelex) troches 10 mg 5 times a day or vaginal suppositories 100 mg qd - bid. Dissolve troche slowly in mouth | 1 - 2 weeks or until resolved; maintenance (with lowest effective dosage) might be required for severe or frequent recurrences | Minimal toxicity. Unpleasant taste, nausea, vomiting; aminotransferase elevations | Troches have high sugar content and often require frequent administration. Suppositories can be more convenient |

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **ORAL CAVITY** *Candida albicans* (cont.) | | | |
| OR | | | |
| Nystatin (Mycostatin) 100,000 U/mL, swish and swallow 5 mL po q 6 h or one 500,000-U tablet dissolved slowly in mouth q 6 h | Same | Large oral doses can produce diarrhea, nausea, vomiting | Generally less effective than ketoconazole, fluconazole, and clotrimazole. Can be effective in fluconazole-resistant candidal infection |
| OR | | | |
| Fluconazole (Diflucan) 100 - 200 mg po qd followed by maintenance therapy 50 - 100 mg po qd; 100 - 200 mg po once weekly is less effective | Same | See CENTRAL NERVOUS SYSTEM, *Cryptococcus neoformans* | Effective in oral candidiasis unresponsive to above oral agents. Higher dosages might be required. Fluconazole solution or itraconazole 200 mg po qd (or intraconazole solution) might be effective against fluconazole-resistant *Candida albicans* |
| OR | | | |
| Ketoconazole (Nizoral) 400 mg po qd followed by maintenance therapy 200 mg po qd - bid for 7 consecutive days per month | Same | Nausea, vomiting; aminotransferase elevations; anaphylaxis, urticaria. Higher dosages can suppress testosterone levels; gynecomastia; adrenal suppression<br>*Drug interactions*<br>Need gastric acidity to be effective; avoid antacids, $H_2$ antagonists; administer 2 hours apart from didanosine. Higher dosages might be necessary if taking rifampin. Avoid concurrent use with triazolam or alprazolam | |
| OR | | | |
| Amphotericin B oral suspension 100 mg/mL, swish and swallow 1 - 5 mL qid | Same | Unpalatable; nausea, vomiting, diarrhea; rare urticaria | Not absorbed. No systemic effects. Intravenous amphotericin B might be necessary for severe disease |
| **Periodontal disease** | | | |
| Hydrogen peroxide gargles for 30 sec bid | Indefinitely | | Oral hygiene measures with manual removal of plaque are essential. Severe periodontal disease can require antibiotic therapy with metronidazole 250 mg po tid or 7 - 10 days (alternatives: clindamycin or amoxicillin-clavulanate [Augmentin]). Antiseptic mouthwash (Listerine) gargles can be effective |
| OR | | | |
| Chlorhexidine gluconate (Peridex) oral rinse 15 mL swished in mouth for 30 sec bid | Indefinitely | Staining of teeth | |
| **ESOPHAGEAL** *Candida albicans* | | | |
| Fluconazole 200 - 400 mg po qd; higher dosages might be required | 14 - 21 days; maintenance with lowest effective dosage | See CENTRAL NERVOUS SYSTEM, *Cryptococcus neoformans* | Empiric treatment for patients with dysphagia or odynophagia who have oral thrush. Endoscopy with biopsy and cultures appropriate for patients who fail to respond within 1 week. Ketoconazole less expensive than fluconazole and effective in most patients |
| OR | | | |
| Ketoconazole 200 mg po bid; see ORAL CAVITY, *Candida albicans* | Same as above | See ORAL CAVITY, *Candida albicans* | |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **ESOPHAGEAL** | | | |
| ***Candida albicans* (cont.)** | | | |
| OR | | | |
| Amphotericin B 0.3 - 0.4 mg/kg IV qd | 10 days or until resolution | | Candidal esophagitis unresponsive to oral agents requires low-dose IV amphotericin B |
| **Cytomegalovirus** | | | |
| Ganciclovir; foscarnet; see OPHTHALMOLOGIC, CMV | 14 - 21 days | See OPHTHALMOLOGIC, CMV | Diagnose by endoscopic appearance plus biopsy showing CMV inclusion bodies and positive culture. Long-term suppressive therapy indicated only after multiple recurrences. Beware of drug resistance |
| **Herpes simplex** | | | |
| Acyclovir IV or valacyclovir po; see SKIN/MUCOCUTANEOUS, disseminated, extensive, or persistent herpes simplex | 10 - 14 days; maintenance required | See SKIN/MUCOCUTANEOUS, disseminated, extensive, or persistent herpes simplex | Diagnose by endoscopic appearance plus positive culture |
| **GASTROINTESTINAL** | | | |
| **Nausea and vomiting** | | | |
| Prochlorperazine (Compazine) 2.5 - 10.0 mg IV or 5 - 10 mg po, or IM q 6 h, or 25 mg po q 12 h | As needed | Fatigue, drowsiness, dizziness, depression; extrapyramidal reactions; dystonic reactions; aminotransferase elevations; constipation | Combinations of these agents often necessary<br>Haloperidol (Haldol) can also be effective |
| Metoclopramide (Reglan) 10 mg po qid, or 1 mg/kg IV q 3 h, or 10 mg IM q 4 - 6 h. Dosage reduction in renal failure | As needed | Same as above | Same as above |
| Lorazepam (Ativan) 0.5 - 2.0 mg po or SL tid - qid | As needed | Similar to benzodiazepines; antegrade amnesia | Effective for anticipatory nausea |
| Granisetron (Kytril) 1 mg po q 12 h, or 10 µg/kg bid IV, or ondansetron (Zofran) 0.15 mg/kg IV infusion for 15 min q 6 h or 4 - 10 mg po q 6 h | As needed | Constipation, diarrhea, abdominal pain; fever, chills; headache; sedation | Reserved for intractable nausea and vomiting unresponsive to other agents. Ondansetron or granisetron in combination with droperidol helpful for intractable nausea and vomiting |
| Dronabinol (Marinol) 2.5 - 10.0 mg po q 8 - 12 h | As needed | See GENERAL/SYSTEMIC, wasting syndrome | Effective in drug-induced nausea. Marijuana can be helpful |
| Droperidol (Inapsine) 2.5 mg IM/IV q 4 - 6 h | As needed | Similar to prochlorperazine | |
| **Diarrhea** | | | |
| *Symptomatic treatment* | | | |
| Loperamide (Imodium) 4 mg po initially then 2 mg q 6 h around the clock and prn (maximum 16 mg qd) | As needed | Abdominal cramps, nausea, abdominal distention, vomiting; dizziness, drowsiness | Around-the-clock regimen more effective than prn. Treat to 2 - 3 bowel movements per day |
| Diphenoxylate-atropine (Lomotil) 2.5 - 5.0 mg po 3 - 6 times daily for 24 - 48 hours; then 2.5 - 5.0 mg tid and prn to control diarrhea (maximum 20 mg qd) | As needed | Ileus; nausea, vomiting, abdominal discomfort; anticholinergic side effects secondary to atropine | Same as above. 2.5 mg diphenoxylate-atropine is equivalent to 2 mg morphine sulfate |
| Paregoric 0.4 mg morphine/mL, 5 - 10 mL qd - qid, or tincture of opium 10 mg morphine/mL, 0.3 - 1.0 mL po qid and prn (maximum 1 mL/dose or 6 mL/d), or equivalent | As needed | Ileus. Altered mental status, hallucinations. Adverse effects common to narcotic analgesics | Same as above. 5 mL paregoric and 0.2 mL tincture of opium are equivalent to 2 mg morphine sulfate |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **GASTROINTESTINAL** | | | |
| **Diarrhea (cont.)** | | | |
| Octreotide (Sandostatin) 100 µg SQ tid, increase by 100 - 200 µg q 1 - 2 wk until maximum of 500 µg SQ tid | Indefinitely | Nausea, steatorrhea; hyperglycemia; pain at injection site | Not approved by FDA. Efficacy not demonstrated. Long-term safety unknown. Octreotide does not improve malabsorption |
| ***Cryptosporidium*** | | | |
| Paromomycin (Humatin) 750 mg po tid | 10 - 14 days or indefinitely | Nausea, vomiting, diarrhea; rare ototoxicity and nephrotoxicity (similar to other aminoglycosides) only if absorbed through ulcerative bowel lesions | No evidence of efficacy. Addition of azithromycin 600 mg po qod might increase effectiveness |
| ***Isospora belli*** | | | |
| Trimethoprim-sulfamethoxazole (TMP-SMX, Septra, Bactrim) 1 DS (double-strength) tablet po qid | 21 days | See PULMONARY, PCP | Usually effective |
| **Cytomegalovirus** | | | |
| Ganciclovir; foscarnet; see OPHTHALMOLOGIC, CMV | 14 - 21 days | See OPHTHALMOLOGIC, CMV | Long-term suppressive therapy indicated only after multiple recurrences. Beware of drug resistance |
| **PULMONARY** | | | |
| ***Pneumocystis carinii*** **pneumonia (PCP)** | | | |
| *Prophylaxis for patients with AIDS (including CD4+ cell count < 200/µL), unexplained fever, or oral candidiasis* | | | |
| Trimethoprim-sulfamethoxazole (TMP-SMX) 1 DS tablet po qd or qod or 3 times a week (eg, M-W-F) | Indefinitely | See TMP-SMX below | TMP-SMX considered most effective for prophylaxis. TMP-SMX provides additional prophylaxis against toxoplasmosis and common bacterial infections |
| *Alternatives to TMP-SMX for prophylaxis* | | | |
| Dapsone 50 mg po bid or 100 mg po qd with or without TMP (Trimpex) 15 mg/kg/d or pyrimethamine (Daraprim) 25 - 75 mg po q wk | Indefinitely | See dapsone plus TMP. Patients allergic to sulfa might tolerate dapsone; some cross-sensitivity | Probably less effective than TMP-SMX; might be less toxic. Check glucose-6 phosphate dehydrogenase (G6PD) before starting dapsone. Lower dosages (eg, 100 mg po 2 times a week) might be effective |
| OR | | | |
| Atovaquone (Mepron) suspension (750 mg/5 mL) 1500 mg po q d or 750 mg po bid, with or without pyrimethamine 25 - 75 mg po q wk | Indefinitely | Headaches; nausea, diarrhea, aminotransferase elevations; rash, drug fever; neutropenia, anemia; transient conjunctivitis; erythema multiforme | Take with food to increase drug absorption. Patients with enteropathy might not absorb a sufficient amount of atovaquone for adequate treatment. Better tolerated than dapsone; efficacy similar |
| OR | | | |
| Inhaled pentamidine (Aeropent) 300 mg q 4 wk using Respirgard II nebulizer | Indefinitely | Bronchospasm and coughing are common; pretreatment with inhaled bronchodilator (eg, albuterol) can help. Increased risk of spontaneous pneumothorax. Minimal systemic effects. Rare pancreatitis, hypoglycemia; rare nephrotoxicity | Effective for prophylaxis against primary PCP when CD4+ cell count > 150/µL. Does not prevent extrapulmonary disease. Upper lobe recurrences from poor drug distribution when inhaled in upright position. Do not use in patients with possible *M tuberculosis* infection because of risk of *M tuberculosis* spread by aerosolization |
| OR | | | |
| Clindamycin (Cleocin) 450 - 600 mg po bid - tid plus primaquine 15 mg po qd | Indefinitely | See Acute PCP below | Efficacy and proper dosages for PCP prophylaxis unknown |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **PULMONARY *Pneumocystis carinii* pneumonia (PCP) (cont.)** | | | |
| OR | | | |
| Pyrimethamine 25 mg - sulfadoxine 500 mg (Fansidar) 1 po q 2 wk | Indefinitely | Stevens-Johnson syndrome, toxic epidermal necrolysis; bone marrow suppression; gastrointestinal, central nervous system toxicity | No studies clearly show efficacy |
| *Acute PCP* | | | |
| TMP-SMX; TMP 15/kg/d given in 3 divided doses either po or as 1- to 2-hour IV infusions; lower dosages (TMP 12 mg/kg/d) can be effective and less toxic | 21 days | Adverse effects commonly appear between 7 and 14 days in more than 50% of patients | TMP-SMX is the drug of choice and should be used unless severe reactions (eg, anaphylaxis, Stevens-Johnson syndrome) are of concern. Oral and intravenous routes equally effective |
| Note: Patients with substantial hypoxemia require concomitant corticosteroids (see below) | | Rashes: maculopapular, exfoliative, Stevens-Johnson syndrome | Mild rash does not necessitate stopping or changing treatment: institute antihistamine or rechallenge with lower dosage of TMP-SMX. Desensitization more successful than rechallenge. |
| | | Hematologic: neutropenia, leukopenia, thrombocytopenia, anemia | If ANC < 500/μL or if platelet count < $30 \times 10^9$/L and bleeding occurs, consider alternative treatment |
| | | *Drug interactions*<br>Concurrent leucovorin calcium therapy associated with increased rate of therapeutic failure | |
| | | Gastrointestinal: nausea, vomiting, aminotransferase elevations | Pretreatment with lorazepam, prochlorperazine, metoclopramide, or dronabinol to reduce nausea. Nausea can be less with oral TMP-SMX. Aminotransferase elevations 4 - 5 times normal require treatment change |
| | | Renal: increased blood urea nitrogen (BUN) and creatinine; hyperkalemia secondary to effects of TMP | TMP decreases creatinine tubular secretion and can elevate serum creatinine levels. Discontinue TMP-SMX if serum creatinine > 3.0 mg/dL |
| | | Hyponatremia | Can be caused by large volume of 5% dextrose in water (D5W) needed for IV administration; dilute each 80 mg TMP in 75 mL D5W or change to oral TMP-SMX. For severe hyponatremia ($Na^+$ < 115 mEq/dL), can dilute in normal saline; administer within 1 hour of preparation to avoid TMP-SMX precipitation |
| | | Neurologic: tremor, psychosis, aseptic meningitis | Tremors can be confused with seizures |
| | | Drug fever. Sepsis-like syndrome, especially upon rechallenge | Drug fever can herald onset of neutropenia, rash, hepatitis, and bone marrow toxicity |
| *Alternatives to TMP-SMX for acute PCP* | | | |
| Pentamidine isethionate (Pentam) 4 mg/kg/d as 1- to 2-hour IV infusion once a day; 3 mg/kg/d might also be effective | 21 days | Adverse effects commonly appear between 7 and 14 days | |
| | | Orthostatic hypotension can be severe and occur with initial infusion | Slow IV infusion for 2 hours can prevent hypotension. Check blood pressure at end of infusion |
| | | Pancreatitis; early or delayed hypoglycemia (can occur after discontinuation of therapy); hyperglycemia | Hypoglycemia can be profound and prolonged, requiring immediate IV D50W followed by D10W glucose infusions. Permanent diabetes can occur. |
| | | *Drug interactions*<br>Avoid concomitant pancreatic toxins such as didanosine, zalcitabine, and alcohol | |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **PULMONARY *Pneumocystis carinii* pneumonia (PCP) (cont.)** | | | |
| Pentamidine isethionate (cont.) | | Renal failure; hyperkalemia. Concomitant nephrotoxic agents (eg, nonsteroidal anti-inflammatory agents) and dehydration increase risk of nephrotoxicity<br><br>Rare: neutropenia, thrombocytopenia; hypocalcemia, hypomagnesemia; aminotransferase elevations; cardiac arrhythmias (rare) with prolongation of QT interval and T-wave flattening | Obtain accurate patient weight every 2 - 3 days to adjust pentamidine dosage. Discontinue pentamidine if creatinine > 3.0 mg/dL. Can resume administration if creatinine < 2 mg/dL |
| OR | | | |
| Clindamycin 600 mg IV or po tid | 21 days | Maculopapular rash (day 10 - 12 most common, usually self-limiting), fever; diarrhea, nausea, vomiting, abdominal cramps, *Clostridium difficile* colitis, aminotransferase elevations | Consider in patients with mild-to-moderate PCP, intolerant of or unresponsive to TMP-SMX |
| plus | | | |
| Primaquine 30-mg base po qd | | Methemoglobinemia from primaquine, hemolysis in G6PD-deficient patients; leukopenia | Check G6PD before initiating primaquine therapy. Check methemoglobin levels when clinically indicated (see dapsone). Vitamin C 1 g po tid might prevent methemoglobinemia. Lower dosage of primaquine (15 mg po qd) can be effective |
| OR | | | |
| Dapsone 50 mg po bid plus either TMP 15 mg/kg/d po in 3 - 4 divided doses or pyrimethamine 50 - 75 mg po qd | 21 days | See toxicities for TMP-SMX. Patients allergic to sulfa often tolerate dapsone. Methemoglobinemia, dose-related hemolysis, bone marrow suppression; rash; fever; nausea, abdominal pain; hyperkalemia; proteinuria, papillary necrosis<br><br>*Drug interactions*<br>Drug interactions with rifampin and rifabutin can render dapsone ineffective | Effective in mild-to-moderate PCP only. Check G6PD before starting dapsone. Check methemoglobin levels if symptomatic or discrepancy between oxygen saturation and simultaneous arterial $PaO_2$. Treat methemoglobinemia > 20% (13% - 20% if anemic or respiratory compromise) with methylene blue 1% solution 2 mg/kg IV once; methylene blue contraindicated in G6PD deficiency. Vitamin C 1 g po tid might prevent methemoglobinemia |
| OR | | | |
| Trimetrexate (Neutrexin) 45 mg/m2 IV qd | 21 days | Granulocytopenia, fever, rash; aminotransferase elevations | Can be effective in some patients as salvage therapy |
| plus | | | |
| Dapsone 50 mg po bid | 21 days | See above | |
| plus | | | |
| Leucovorin calcium (folinic acid) 20 mg/m2 IV or po q 6 h | 24 days | | Must be administered for 72 hours after the last dose of trimetrexate. Large IV fluid load with leucovorin administration can result in volume overload |
| OR | | | |
| Atovaquone suspension (750 mg/5 mL) 750 mg po bid with food | 21 days | Rash, drug fever; headaches; nausea, diarrhea, aminotransferase elevations; neutropenia, anemia; transient conjunctivitis; erythema multiforme | Higher therapeutic failure rate than TMP-SMX. For patients who fail or are intolerant of TMP-SMX, pentamidine, dapsone-TMP, or clindamycin-primaquine. Take with food to increase drug absorption. Patients with enteropathy might not absorb a sufficient amount of atovaquone for adequate treatment |
| plus | | | |
| Pyrimethamine 50 - 75 mg po qd | | | |
| *Adjunctive corticosteroid therapy for acute PCP with $PaO_2 \leq 70$ mmHg* | | | |
| Prednisone po or methylprednisolone (Solu-Medrol) IV: 40 mg bid for 5 days followed by 40 mg qd for 5 days, followed by 20 mg qd for 11 days (can be tapered to 0 mg for last 11 days also) | 21 days | Hyperglycemia, sodium retention, potassium wasting. Psychiatric syndromes. Exacerbation of Kaposi sarcoma, thrush, herpes infections, and other opportunistic infections | Corticosteroids indicated in conjunction with antipneumocystis therapy in all patients with $PaO_2 \leq 70$ mmHg. Begin corticosteroids concurrently with PCP treatment or if $PaO_2$ decreases to $\leq 70$ mmHg within 72 hours of initiating PCP treatment. |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **CENTRAL NERVOUS SYSTEM** | | | |
| ***Toxoplasma gondii*** | | | |
| *Prophylaxis* | | | |
| Most PCP prophylaxis regimens provide some protection against toxoplasmosis | Indefinitely | See PULMONARY, PCP | TMP-SMX, dapsone plus TMP or pyrimethamine, clindamycin plus primaquine, atovaquone plus pyrimethamine, and pyrimethamine-sulfadoxine provide some prophylaxis against toxoplasmosis. Aerosolized pentamidine not effective; adding another agent to provide toxoplasmosis prophylaxis not required. Clarithromycin and azithromycin provide some benefit |
| *Acute* | | | |
| Pyrimethamine 75 - 100 mg po qd (every other day if bone marrow suppression) plus leucovorin calcium (folinic acid) 10 -25 mg po qd | 6 - 8 weeks for acute therapy | Leukopenia, anemia, thrombocytopenia | Clinical response or regression of lesions on imaging studies is usually noted within 2 weeks. Maintenance required indefinitely to prevent relapse |
| plus either | | | |
| Sulfadiazine 1.0 - 1.5 g po q 6 h | Same | Rash, drug fever; leukopenia, thrombocytopenia; crystalluria with renal failure | Sulfadiazine probably provides effective prophylaxis against PCP. Ensure adequate fluid intake |
| or | | | |
| Clindamycin 600 - 900 mg po or IV qid | Same | See PULMONARY, PCP | |
| *Alternative when intolerant of sulfadiazine and clindamycin* | | | |
| Pyrimethamine plus leucovorin as above | Same | See above | |
| plus one of the following | | | |
| Clarithromycin 1 g po bid or azithromycin 1200 - 1500 mg po qd | Same | See GENERAL/SYSTEMIC, MAC | |
| or | | | |
| Atovaquone suspension (750 mg/5 mL) 750 mg po qid with meals | Same | See PULMONARY, PCP | Not proved effective |
| or | | | |
| Doxycycline 100 mg po tid - qid or minocycline 200 mg po bid | Same | Tetracycline side effects | Not proved effective |
| or | | | |
| Dapsone 100 mg po qd | Same | See PULMONARY, PCP | |
| or | | | |
| Pyrimethamine alone 100 - 200 mg po qd | Same | See PULMONARY, PCP | Not as effective as above regimens |
| OR | | | |
| TMP/SMX as for acute PCP | Same | See PULMONARY, PCP | |
| *Maintenance* | | | |
| Pyrimethamine 25 - 50 mg po qd | Indefinitely | | Add leucovorin calcium if evidence of leukopenia |
| plus either | | | |
| Sulfadiazine 1 g po q 12 h | Indefinitely | | |
| or | | | |
| Clindamycin 300 - 450 mg po q 6 - 8 h | Indefinitely | | |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **CENTRAL NERVOUS SYSTEM** | | | |
| ***Cryptococcus neoformans*** | | | |
| *Prophylaxis* | | | |
| Fluconazole provides limited prophylaxis | | | Primary prophylaxis not routinely recommended. Can be considered for patients with CD4+ cell counts < 50/μL. No long-term survival benefit. Fluconazole resistance reported |
| *Meningitis or disseminated cryptococcosis* | | | |
| *Acute* | | | |
| Amphotericin B 0.7 - 1.0 mg/kg/d IV with or without 5-flucytosine (Ancobon) 100 mg/kg po qd in 4 divided doses for first 2 - 4 weeks. If clinically improved after 7.5 mg/kg total amphotericin B administration, can change to fluconazole 400 mg po qd or itraconazole 200 mg po bid | 6 - 8 weeks; amphotericin total dosage not to exceed 2 g | Renal failure, hypokalemia, hypomagnesemia. Liposomal amphotericin B might decrease toxicity<br><br>Fever, chills; anemia, thrombophlebitis<br><br>Granulocytopenia; nausea, vomiting, diarrhea, aminotransferase elevations; rash from flucytosine<br><br>Flucytosine toxicities (rash, metallic taste, leukopenia, thrombocytopenia) limit its usefulness | Pretreatment with diphenhydramine, acetaminophen or IV morphine can decrease amphotericin-induced fevers, chills, and rigors. Pretreatment not recommended routinely. Administer for 4 - 6 hours in D5W. Addition of heparin 500 U and hydrocortisone 25 mg to amphotericin IV solution can decrease phlebitis. Infusion of 500 - 1000 mL normal saline before administration of amphotericin B can minimize renal toxicity. 5-Flucytosine not indicated if granulocytopenia or thrombocytopenia is present<br><br>Markedly increased intracranial pressure (> 240 mm) might require cerebrospinal fluid drainage (20 - 30 mL or more per day by lumbar puncture or continuous lumbar drain), or possibly corticosteroid, mannitol, or acetazolamide (Diamox) therapy |
| OR | | | |
| Fluconazole 400 - 800 mg po qd. Dosage reduction in renal failure. Higher dosages (eg, 800 - 1200 mg po qd) might increase efficacy | 8 - 12 weeks | Nausea, vomiting, diarrhea; dizziness; aminotransferase elevations; rare cutaneous reactions, skin pigmentation, alopecia<br><br>*Drug interactions*<br>Increased phenytoin (Dilantin) and warfarin (Coumadin) levels; higher fluconazole dosages might be necessary for patients taking rifampin | As effective as amphotericin B against mild or moderate disease; unknown whether equally effective against severe disease. Fluconazole penetrates central nervous system and most body tissues, including prostate. Addition of 5-flucytosine might be of benefit |
| *Maintenance* | | | |
| Fluconazole 200 - 400 mg po qd | Indefinitely | Same | Higher dosages might be necessary for recurrent disease |
| OR | | | |
| Amphotericin B 0.5 - 0.8 mg/kg/d 3 - 5 times a week | Indefinitely | Same | |
| **Syphilis** | | | |
| Aqueous crystalline penicillin G 3 - 4 mU IV q 4 h (total 18 - 24 mU/d) | 10 - 14 days | Usual penicillin adverse effects, Jarisch-Herxheimer reaction; seizures from high-dosage penicillin in renal failure | Continued serologic and clinical follow-up required to assess adequacy of treatment for neurosyphilis. Persons with ophthalmic auditory, or cranial nerve abnormalities or other syndromes consistent with neurosyphilis should receive daily penicillin therapy for 10 - 14 days. Intravenous penicillin preferred for adequate central nervous system penetration. For penicillin-allergic patients, consultation with an expert advised. Administer additional benzathine penicillin 2.4 mU IM weekly after completion of neurosyphilis treatment to ensure 3 weeks total penicillin therapy |
| OR | | | |
| Procaine penicillin G 2.4 mU IM qd | 10 - 14 days | Same. Probenecid rash | |
| plus | | | |
| Probenecid 500 mg po qid | 10 - 14 days | | |

*Continued*

**Table 1. Continued**

| System, Problem, and Drug Regimen | Duration | Adverse Effects/Drug Interactions | Comments |
|---|---|---|---|
| **CENTRAL NERVOUS SYSTEM** | | | |
| **Peripheral neuropathy** | | | |
| Desipramine (Norpramin) or amitriptyline (Elavil) 25 - 150 mg po hs | Indefinitely | Usual tricyclic side effects; drowsiness; orthostatic hypotension; anticholinergic symptoms | Pain relief occurs in 3 - 5 days. Desipramine causes less sedation and fewer anticholinergic effects. Other tricyclic drugs might be equally effective |
| Phenytoin (diphenylhydantoin, Dilantin) 100 mg po tid | Indefinitely | Usual side effects and drug-drug interactions | Generally ineffective |
| Carbamazepine (Tegretol) 100 - 300 mg po bid | Indefinitely | Leukopenia, bone marrow suppression, rare agranulocytosis; rash; drowsiness, dizziness; aminotransferase elevations | Less desirable because of bone marrow effects. Need to monitor carbamazepine levels to avoid toxicity |
| Mexiletine (Mexitil) 150 mg po bid - tid | Indefinitely | Nausea, vomiting, epigastric pain; dizziness, tremor; bradycardia; rare seizures, leukopenia, agranulocytosis | Less desirable because of side effects |
| Capsaicin (Axsain, Zostrix-HP) 0.075% topical cream qid | Indefinitely | Minor burning sensation, skin irritation, erythema | Pain relief delayed 2 - 4 weeks. No systemic effects |
| Gabapentin (Neurontin) 300 - 400 mg po tid via dose escalation; dosage reduction in renal failure | Indefinitely | Thrombocytopenia; somnolence, dizziness, ataxia, nystagmus, fatigue, somnolence, headache; nausea, vomiting, diarrhea | Can be helpful when other agents fail |

*Text continued from page 73*

principally in order of efficacy. Where more than one drug is effective for a specific condition, recommendations are usually in an order that favors the least expensive choice among equally effective options. The most common and clinically important adverse effects and drug interactions are listed.

## References

A selected bibliography highlights the most important management and therapeutic problems associated with HIV infection and AIDS. References including articles about *P carinii* pneumonia[21] and other mycobacterial diseases[22]; dermatologic,[23-25] oropharyngeal,[26,27] ophthalmologic,[28-30] and gastrointestinal problems[31,32]; the AIDS wasting syndrome[33-35]; and neurologic disease.[36,37] Additional references are intended to assist primary care clinicians[38] with the broad spectrum of problems associated with HIV infection and AIDS,[39,40] other sexually transmitted diseases,[41] and special treatment considerations for occupational exposures[42-45] and pregnancy.[46]

## Other Sources

Information about clinical trials is available through the AIDS Clinical Trials Information Service at 1-800-TRIALS A, and through the AIDS Treatment Information Service (ATIS) at 1-800-HIV-8440. ATIS also has printed and Website guidelines and information about approved therapies and management protocols at http://hivatis.org. Our National HIV Telephone Consultation Service (Warmline) at the University of California, San Francisco, Department of Family and Community Medicine at San Francisco General Hospital provides clinical consultation and education for health care providers; the Warmline is in operation on weekdays at 1-800-933-3413. The AIDS Education and Training Centers (AIDS ETCs) of the Health Resources and Services Administration (HRSA) at 1-301-443-6364 offers education, training, and consultation services to health care providers. HRSA also offers special-topic teleconferences. Additional information can be accessed at other Websites, including the San Francisco General Hospital-based site at http://www.hivinsite.ucsf.edu and the American Medial Association HIV/AIDS site at http://www.ama-assn.org.

We gratefully acknowledge the staff of the HIV Telephone Consultation Service and the faculty, staff, and house staff at San Francisco General Hospital for making this work possible, and Mary A. Hanville for assistance in preparation of this manuscript.

## References

1. Goldschmidt RH, Dong BJ. Treatment of AIDS and HIV-related conditions — 1997. J Am Board Fam Pract 1997:10:144-67.
2. Report of the NIH Panel to Define Principles of Therapy of HIV Infection and guidelines for the use of antiretroviral agents in HIV-infected adults and adolescents. MMWR Morb Mortal Wkly Rep 1998; 47(RR-5):1-82. Also available at http://www.hivatis.org.
3. Carpenter CC, Fischl MA, Hammer SM, Hirsch MS, Jacobsen DM, Katzenstein DA, et al. Antiretroviral therapy for HIV infection in 1998. Updated recommendations of the International AIDS Society - USA Panel. JAMA 1998;280:78-86.
4. Gazzard B, Moyle G, on behalf of the BHIVA Guidelines Writing Committee. 1998 revision to the British HIV Association guidelines for antiretroviral treatment of HIV seropositive individuals. Lancet 1998;352:314-6.
5. Goldschmidt RH, Balano KB, Legg JJ, Dong BJ. Individualized strategies in the era of combination antiretroviral therapy. J Am Board Fam Pract 1998;11: 158-64.
6. Maenza J, Flexner C. Combination antiretroviral therapy for HIV infection. Am Fam Physician 1998; 57:2789-98.
7. Volberding PA, Deeks SG. Antiretroviral therapy for HIV infection: promises and problems. JAMA 1998;279:1343-4.
8. Levy JA. Caution: should we be treating HIV infection early? Lancet 1998;352:982-3.
9. Flexner C. HIV-protease inhibitors. N Engl J Med 1998;338:1281-92.
10. Lisziewicz J, Jessen H, Finzi D, Siliciano RF, Lori F. HIV-1 suppression by early treatment with hydroxyurea, didanosine, and a protease inhibitor. Lancet 1998;352:199-200.
11. Hirsch MS, Klibanski A. Editorial response: What price progress? Pseudo-Cushing's syndrome associated with antiretroviral therapy in patients with human immunodeficiency virus infection. Clin Infect Dis 1998;27:73-5.
12. Lo JC, Mulligan K, Tai VW, Algren H, Schambelan M. "Buffalo hump" in men with HIV-1 infection. Lancet 1998;351:867-70.
13. Carr A, Samaras K, Chisholm KF, Cooper DA. Pathogenesis of HIV-1-protease inhibitor-associated peripheral lipodystrophy, hyperlipidaemia, and insulin resistance. Lancet 1998;352:1881-3.
14. Burman WJ, Reves RR, Cohn DL. The case for conservative management of early HIV disease. JAMA 1998;280:93-5.

15. Palella FJ Jr, Delaney KM, Moorman AC, Loveless MO, Fuhrer J, Satten GA, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. HIV Outpatient Study Investigators. N Engl J Med 1998;338:853-60.
16. Sepkowitz KA. Effect of HAART on natural history of AIDS-related opportunistic disorders. Lancet 1998; 351:228-30.
17. 1997 USPHS/IDSA guidelines for the prevention of opportunistic infections in persons infected with human immunodeficiency virus. MMWR Morb Mortal Wkly Rep 1997;46(RR-12):1-46.
18. Tural C, Romeu J, Sirera G, Andreu D, Conejero M, Ruiz S, et al. Long-lasting remission of cytomegalovirus retinitis without maintenance therapy in human immunodeficiency virus-infected patients. J Infect Dis 1998;177:1080-3.
19. Macdonald JC, Torriani FJ, Morse LS, Karavellas MP, Reed JB, Freeman WR. Lack of reactivation of cytomegalovirus (CMV) retinitis after stopping CMV maintenance therapy in AIDS patients with sustained elevations in CD4 T cells in response to highly active antiretroviral therapy. J Infect Dis 1998;177:1182-7.
20. Centers for Disease Control and Prevention. Prevention and treatment of tuberculosis in patients infected with human immunodeficiency virus. Principles of therapy and revised recommendations. MMWR Morb Mortal Wkly Rep 1998; 47(RR-20):1-58. Available at http://www.cdc.gov.
21. Masur H. Prevention and treatment of pneumocystis pneumonia. N Engl J Med 1992;327:1853-60.
22. Horsburgh CR Jr. Advances in the prevention and treatment of Mycobacterium avium disease. N Engl J Med 1996;335:428-30.
23. Tschachler E, Bergstresser PR, Stingl G. HIV-related skin diseases. Lancet 1996;348:659-63.
24. Cohen PR, Grossman ME. Recognizing skin lesions of systemic fungal infections in patients with AIDS. Am Fam Physician 1994;49:1627-34.
25. Coopman SA, Johnson RA, Platt R, Stern RS. Cutaneous disease and drug reactions in HIV infection. N Engl J Med 1993;328:1670-4.
26. Greenspan D, Greenspan JS. HIV-related oral disease. Lancet 1996;348:729-33.
27. Weinert M, Grimes RM, Lynch DP. Oral manifestations of HIV infection. Ann Intern Med 1996;125: 485-96.
28. Cunningham ET Jr, Margolis TP. Ocular manifestations of HIV infection. N Engl J Med 1998;339:236-44.
29. Jacobson MA. Treatment of cytomegalovirus retinitis in patients with the acquired immunodeficiency syndrome. N Engl J Med 1997;337:105-14.
30. Whitley RJ, Jacobson MA, Friedberg DN, Holland GN, Jabs DA, Dieterich DT, et al. Guidelines for the treatment of cytomegalovirus diseases in patients with AIDS in the era of potent antiretroviral therapy: recommendations of an international panel. Arch Intern Med 1998;158:957-69.
31. Sharpstone D, Gazzard B. Gastrointestinal manifestations of HIV infection. Lancet 1996;348:379-83.
32. DuPont HL, Marshall GD. HIV-associated diarrhoea and wasting. Lancet 1995;346:352-6.
33. Macallan DC, Noble C, Baldwin C, Jebb SA, Prentice AM, Coward WA, et al. Energy expenditure and wasting in human immunodeficiency virus infection. N Engl J Med 1995;333:83-8.
34. Grinspoon S, Corcoran C, Askari H, Schoenfeld D, Wolf L, Burrows B, et al. Effects of androgen administration in men with the AIDS wasting syndrome. A randomized, double-blind, placebo-controlled trial. Ann Intern Med 1998;129:18-26.
35. Cofrancesco J Jr, Whalen JJ 3rd, Dobs AS. Testosterone replacement treatment options for HIV-infected men. J Acquir Immune Defic Syndr Hum Retrovirol 1997;16:254-65.
36. Simpson DM, Tagliati M. Neurologic manifestations of HIV infection. Ann Intern Med 1994;121:769-85.
37. Newton HB. Common neurologic complications of HIV-1 infection and AIDS. Am Fam Physician 1995;51:387-98.
38. Soloway B. A new era in HIV care. Am Fam Physician 1997;56:37, 40-2.
39. Legg JJ, Balano KB. Symptom management in HIV-infected patients. Prim Care 1997;24:597-606.
40. Fournier AM, Carmichael C. Socioeconomic influences on the transmission of human immunodeficiency virus infection: the hidden risk. Arch Fam Med 1998;7:214-7.
41. 1998 guidelines for treatment of sexually transmitted diseases. Centers for Disease Control and Prevention. MMWR Morb Mortal Wkly Rep 1998;47(RR-1):1-111.
42. Public Health Service guidelines for the management of health-care worker exposures to HIV and recommendations for postexposure prophylaxis. Centers for Disease Control and Prevention. MMWR Morb Mortal Wkly Rep 1998;47(RR-7):1-33.
43. Gerberding JL. Prophylaxis for occupational exposure to HIV. Ann Intern Med 1996;125:497-501.
44. Gerberding JL. Management of occupational exposures to blood-borne viruses. N Engl J Med 1995;332: 444-51.
45. Goldschmidt RH, Legg JJ, Balano KB. Occupational exposure to HIV: new recommendations for treating health care workers. J Am Board Fam Pract 1996;9: 455-8.
46. Public Health Service Task Force recommendations for the use of antiretroviral drugs in pregnant women infected with HIV-1 for maternal health and for reducing perinatal HIV-1 transmission in the United States. Centers for Disease Control and Prevention. MMWR Morb Mortal Wkly Rep 1998;47(RR-2):1-30.