7/1/03 This manual is being completely revised. The drugs listed in SEER Book 8 may not include any antineoplastic agents developed since 1993. Please check our web site under **New Releases** at: ***http://SEER.CANCER.GOV*** for the new edition of this database containing a complete and current list of cancer drugs.

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NATIONAL INSTITUTES OF HEALTH
National Cancer Institute

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SELF-INSTRUCTIONAL MANUAL FOR TUMOR REGISTRARS

Book 8 - ANTINEOPLASTIC DRUGS

Third Edition

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BOOK 8: ANTINEOPLASTIC DRUGS

CONTENTS

Introduction

OBJECTIVES AND CONTENT OF INSTRUCTIONAL BOOK 8

Book 8 was first published in 1981 in response to numerous requests from SEER Program participants for identification of drugs which should be included on the abstract of the medical record as cancer-directed therapy. The demand for this manual has been rewarding, and, therefore, this update is being offered in 1993.

Many new anti-cancer agents have been developed since the original publication of this book, and these have been added to the appropriate sections of the new edition. Experimental drugs proven to be ineffective are listed with a '#' sign following the drug name. Brand names formerly used and drugs not in clinical use at this time are also designated with a '#' sign. The index will assist you in locating a particular drug.

This publication is divided into six sections:

1. Chemotherapeutic drugs and combination regimens
2. Ancillary drugs
3. Differentiation-inducing agents
4. Biological response modifiers
5. Hormones and agents acting via hormonal mechanisms
6. Drugs used in the treatment of AIDS and its complications

Chemical formulae and information about drug metabolism and mechanisms of action are not included in this manual. If you find it necessary to know the drug's formula or pharmacology, please refer to the following resources:

1. Fleeger CA, ed. *USAN and the USP Dictionary of Drug Names*. Rockville, MD, United States Pharmacopeial Convention, Inc., 1992.

2. *Drug Information for the Health Care Professional. USP-DI (12th Edition), Volumes IA and IB*. Rockville, MD, United States Pharmacopeial Convention, Inc., 1992.

3. Chabner BA, Collins JA. *Cancer Chemotherapy: Principles and Practice*. JB Lippincott Company, New York, 1990.

4. *NCI Investigational Drugs Pharmaceutical Data*. NIH Publication No. 91-2141. Bethesda, MD, US Department of Health and Human Services, 1990.

5. Physicians Desk Reference, Montvale, New Jersey, Medical Economics Data, 1993.

In October 1982, the National Cancer Institute (NCI) announced the establishment of PDQ (Physicians Data Query). PDQ is a clinically oriented computer database developed to make recent cancer information widely available to the medical community. PDQ provides state-of-the-art cancer treatment information and descriptions of NCI-sponsored clinical trials for all major cancer sites. For clinical trials involving antineoplastic agents, protocol summaries can be retrieved using a drug's generic name, acronym, short name, or synonym.

Information on both established drugs and investigational agents can be obtained through PDQ from CANCERLIT searches on the National Library of Medicine (NLM) computer system. CANCERLIT is a bibliographic database that contains approximately 700,000 citations, including journal articles, meeting papers, books, reports, and doctoral theses. It is updated each month with close to 5,500 new citations, most containing abstracts.

Information about access to PDQ can be obtained from the PDQ Information Coordinator, National Cancer Institute, R. A. Bloch International Cancer Information Center, Building 82, Room 105, 9030 Old Georgetown Road, Bethesda, MD 20892. Instructions for accessing CANCERLIT through PDQ are included in the PDQ User's Guide.

Continuous updating is required to make this manual a useful reference. Therefore, suggestions with respect to changes or additions are welcome. With your help, this book can be an up-to-date directory of antineoplastic agents that you may encounter in abstracting a medical record.

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SYMBOLS USED IN THIS MANUAL

+	NSC number, a National Service Center number from the National Cancer Institute (NCI). This number is assigned to a drug during its investigational phase, prior to the adoption of a United States Adopted Name (USAN).
*	Published in the Federal Register as a Federal Drug Administration (FDA) registered name.
#	Experimental agent proven to be ineffective, brand name formerly used, or drug thought not to be in clinical use at this time.
Underlined Names	*USAN* official names (usually of the drug substance, as distinct from the dosage forms), as used in current editions of the *United States Pharmacopeia* and the *National Formulary*.

Section 1

CHEMOTHERAPEUTIC DRUGS AND COMBINATION REGIMENS

Chemotherapy is a relatively new form of cancer treatment. Prior to the 1940's, no drugs were known to be effective against cancer. However, during that decade, observations of the effects of nitrogen mustard gas on the lymphoid system of seamen exposed during World War II resulted in its use in patients with Hodgkin's disease and other lymphomas and led to the development of other alkylating agents. Similarly, studies of the effect of folic acid on the growth of leukemic cells in children with acute lymphoblastic leukemia led to the development of antifolate agents in the early 1950's. This new approach to cancer therapy made it possible to treat disease which had spread beyond its site of origin.

Development and Testing of New Chemotherapeutic Agents

Scientists work continuously to develop new antineoplastic agents and to explore different methods for using agents which are currently available. New drugs undergo rigorous preclinical evaluations to determine antineoplastic effects in cancer cell cultures and animal tumor models. Drugs which demonstrate potential in preclinical studies then must be formulated for human use and go through toxicology testing in laboratory animals before entering systematic clinical evaluation.

Clinical studies of chemotherapeutic agents are conducted according to strict guidelines, or protocols, which provide specific instructions for patient selection, drug administration, and observation of treatment effects. There are three phases to clinical evaluation:

Phase I clinical trials assess the pharmacology and dose-limiting toxicity of the drug in humans. Patients in Phase I clinical trials generally have advanced malignancies which are no longer amenable to conventional cancer therapy.

Phase II studies determine the activity, or therapeutic effect, of a new drug in specific tumor types. Patients in Phase II clinical trials have tumors that are no longer amenable to conventional therapy; their tumor masses must be measurable on clinical examination or by radiographic studies to evaluate tumor response to the new drug. Response rates, duration of response, and frequency and severity of side effects are recorded in Phase II clinical trials.

Phase III clinical trials compare the efficacy of a standard drug (or treatment) to that of a new drug (or treatment) which is expected to be at least as effective as the standard therapy for a specific cancer stage and primary site. In most Phase III studies, patients are randomly assigned to treatment groups, and the response rate and toxicity for the new therapy is compared to that for the standard therapy ("control"). Phase III studies establish the place of a new drug or treatment in clinical oncology practice.

Clinical studies, especially Phase III clinical trials, require large numbers of patients with specific tumor types and stages. To complete these studies in a timely and efficient manner, investigators from different practice locations have joined together as **cooperative clinical trials groups**. Through this mechanism, patients from diverse geographical areas can enter a clinical study under the care of

their own oncology specialist. Each patient receives therapy according to a defined protocol, and data on response and toxicity for each patient are collected by a central office for monitoring and analysis.

Many cooperative groups evaluate surgical procedures or radiation therapy treatments, often combined with chemotherapy. Some cooperative groups conduct Phase I-II studies as well as Phase III randomized controlled clinical trials. Examples of cooperative clinical trials groups include the Cancer and Leukemia Group B (CALGB), the Southwest Oncology Group (SWOG), the Eastern Cooperative Oncology Group (ECOG), the National Surgical Adjuvant Breast and Bowel Project (NSABP), and the Radiation Therapy Oncology Group (RTOG). See page 95 for a list of the cooperative clinical trials groups.

How Chemotherapy Works

Chemotherapeutic agents inhibit the reproduction of cancer cells by interfering with DNA synthesis and mitosis, causing the cells to stop growing (cytostatic agents) or to die (cytotoxic agents). Cancer cells that are synthesizing DNA and rapidly dividing are more vulnerable to the effects of many drugs than are those in a resting (non-cycling) phase.

In systemic chemotherapy, drugs administered by injection or orally are carried throughout the body in the blood stream. Most drugs will reach cells in all areas of the body. However, certain "sanctuary" sites (such as the testes, eyes, and central nervous system) are protected by physiological barriers. For example, some drugs will not cross the blood-brain barrier and so must be administered directly into the cerebrospinal fluid (CSF) surrounding the brain and spinal cord (intrathecal administration). Carmustine (BCNU) and high-dose cytarabine (Ara-C) are transported across the blood-brain barrier.

In general, chemotherapeutic agents are classified into groups according to their mechanism of action. They may also be classified according to the timing of action in cell division: phase nonspecific agents act throughout the mitotic cycle, while phase-specific drugs act at defined points in the cell division process.

Alkylating agents cause cross-linking and abnormal base pairing that interferes with DNA replication. DNA strands may also break, and synthesis of enzymes and nucleic acids may be inhibited. Most alkylating agents are cell cycle nonspecific and affect both resting and dividing cells. However, rapidly dividing cells are most sensitive to their effects. Because normal cells in the bone marrow and gastrointestinal tract divide rapidly, bone marrow suppression and gastrointestinal disturbances are common toxicities associated with these drugs.

Alkylating agents include:

1. Nitrogen mustard and its derivatives: mechlorethamine (Mustargen), phenylalanine mustard (Melphalan), chlorambucil (Leukeran), cyclophosphamide (Cytoxan)

2. Ethylenimine derivatives: triethylene-thiophosphoramide (Thio-TEPA)

3. Alkyl sulfonates: busulfan (Myleran)

4. Nitrosoureas: carmustine (Lomustine)

5. Triazines: DTIC (Dacarbazine)

Antimetabolites are structurally similar to natural metabolites which are necessary for cell function. These agents replace natural metabolites in important molecules, altering the function of enzymes required for cell metabolism and protein synthesis. This interference is most pronounced during the S (synthesis) phase of cell division when DNA, RNA, and protein synthesis occurs. The enzymatic block produced by methotrexate can be bypassed by administration of folinic acid (leucovorin), which then "rescues" normal cells from methotrexate action. Antimetabolites include:

1. Folic acid analogues: methotrexate (Amethopterin, MTX)

2. Pyrimidine analogues: 5-fluorouracil (5-FU)

3. Purine analogues: 6-mercaptopurine (6-MP)

Natural products include **antibiotics**, **plant alkaloids**, and **enzymes**. Antitumor antibiotics may have antimicrobial properties, but their cytotoxic properties are most prominent. These agents prevent nucleic acid synthesis by a process called intercalation and block DNA and RNA transcription. They act throughout the cell cycle, but some are more effective during S (synthesis) and M (mitosis) phases. Antitumor antibiotics include dactinomycin (Actinomycin D), doxorubicin (Adriamycin), daunorubicin (Daunomycin), bleomycin (Blenoxane), and mitomycin C (Mutamycin).

Plant alkaloids, derived from the periwinkle plant *Vinca rosea*, are also called vinca alkaloids. These drugs interfere with the microtubular spindle proteins necessary for cell division and thus inhibit mitosis (M phase). Vinblastine (Velban, VBL) and vincristine (Oncovin, VCR) are the two vinca alkaloids commonly used in clinical oncology.

L-asparaginase (Elspar) is an **enzyme** which catalyzes the breakdown of asparagine into aspartic acid and ammonia. It inhibits the growth of tumor cells that are unable to synthesize l-asparagine, an amino acid necessary for protein synthesis. Cells that make l-asparagine from aspartic acid are not affected.

Several anticancer drugs are classified as **miscellaneous agents**, either because they do not fall into one of the distinct categories above or because their action is not fully understood. Cis-diammine dichloroplatinum II (Cisplatin) is a platinum-containing complex which binds to DNA and disrupts its function. Hydroxyurea (Hydrea) inhibits enzymes which are important in repair of DNA damage. Procarbazine (Matulane) is broken down by the body into active metabolites which bind nuclear DNA and inhibit DNA, RNA, and protein synthesis.

Combination Chemotherapy Regimen

Few chemotherapeutic drugs in general use today are administered as single agents. Combinations of chemotherapeutic agents are carefully selected, taking advantage of different mechanisms of drug action to increase tumor response rates, to prevent or delay the development of drug resistance, and to modulate side effects of therapy.

A treatment cycle is a round of a chemotherapy regimen administered according to a specific schedule. Treatment cycles for most regimens are 21 or 28 days. The first day of the cycle is Day 1, the second is Day 2, and so forth. The treatment protocol specifies each drug, dose and method of administration, and schedule (day of cycle). The acronym for the regimen is usually formed from the first letters of the chemotherapeutic agents used in the regimen. Thus MOPP, for the treatment of Hodgkin's disease, is a combination of nitrogen Mustard, vincristine (Oncovin), Procarbazine, and Prednisone. See page 29 for a list of commonly-used combination regimens.

A cycle of the MOPP regimen is shown below. Nitrogen mustard and vincristine are administered intravenously on Day 1 and Day 8, usually in the outpatient setting. In addition, procarbazine and prednisone are taken orally for the first 14 days of the cycle. Note that no chemotherapy is administered on Days 15 through 28; this rest period allows recovery from any side effects that occur. The regimen is repeated every 28 days for a minimum of six cycles, or until complete remission is achieved plus two additional cycles.

While some treatment plans require a specific number of chemotherapy cycles, in other cases, treatment continues until the patient's disease is no longer controlled by the chemotherapeutic regimen.

MOPP Regimen for Hodgkin's Disease (28-day Cycle)

Drug	Dose*	Schedule
M - Nitrogen mustard	6.0 mg/m^2 IV	Days 1 and 8
O - Vincristine (Oncovin)	1.4 mg/m^2 IV	Days 1 and 8
P - Procarbazine	100.0 mg/m^2 PO	Days 1 through 14
P - Prednisone	40.0 mg/m^2 PO	Days 1 through 14

* Dose is usually calculated as milligrams (mg) drug per square meter (m^2) body surface area. Body surface area is determined from charts depicting surface area as a function of the patient's height and weight.

When disease is widespread, as in the acute leukemias, intensive chemotherapy may be administered in an attempt to eradicate all evidence of disease. This period of treatment is called **induction**; the absence of clinically demonstrable disease is termed **remission**. Following induction, a second period of intensive treatment (**consolidation**) may be given to increase the remission rate or increase duration of remission. In some clinical situations, a prolonged period of less intense chemotherapy, called **maintenance therapy**, is also administered to delay disease recurrence (relapse).

In certain cancers such as Hodgkin's disease, re-treatment of patients who relapse following a prolonged disease-free interval may be effective. This attempt to achieve another remission is often called **salvage therapy.**

Administration of Chemotherapy

The most common routes of administration of chemotherapy are oral and intravenous. The drug enters the bloodstream by absorption from the gastrointestinal tract or directly by intravenous injection and is carried to cells throughout the body. However, in specific clinical situations, other methods of administration are required to achieve higher drug concentrations in specific tissues or to access tissues that are isolated by physiologic barriers.

Drugs that do not cross the blood-brain barrier must be administered directly into the cerebrospinal fluid (CSF) surrounding the brain and spinal cord (**intrathecal administration**). This is accomplished through a lumbar puncture (spinal tap) needle, into an implanted access device (Ommaya reservoir). Intrathecal chemotherapy is used to treat meningeal leukemia or lymphoma or occasionally in other tumors which have meningeal metastases. In patients with acute lymphoblastic leukemia, intrathecal chemotherapy may be given as prophylaxis to prevent the development of meningeal leukemia. Methotrexate and cytosine arabinoside are chemotherapeutic agents commonly used intrathecally.

Chemotherapeutic agents such as bleomycin may be injected directly into the pleural or pericardial space to control malignant effusions.

Intraperitoneal administration of drugs may be used to treat tumors such as ovarian cancer which spread by direct extension through the abdominal cavity. Chemotherapy is injected into the peritoneal cavity using techniques similar to peritoneal dialysis. This approach allows increased concentrations of drug in the abdominal cavity compared to lower levels achieved by intravenous administration.

Specialized infusion methods have been designed to increase drug delivery to affected tissues while sparing normal or uninvolved tissues. These require insertion of a catheter into the artery which supplies blood to the affected area and infusion of the drug through the catheter. Hepatic artery infusion has been used to treat primary liver tumors or liver metastases, and carotid artery infusion has been attempted to treat head and neck cancers or brain tumors. While advances in technology have simplified these infusion procedures, they are still investigational. Their role needs to be determined by careful scientific evaluation through clinical trials.

Monitoring Side Effects

Antineoplastic drugs affect not only cancer cells but also normal cells. For chemotherapeutic drugs, the type and severity of side effects depend on the specific agent, its dose, and its route of administration. Side effects are usually temporary and respond to supportive treatment. However, if toxicity is severe or persistent, drug dosages may be reduced for subsequent cycles to decrease

toxicity, a new drug with similar actions but different side effects may be substituted for the drug causing symptoms, or scheduled therapy may be delayed to allow recovery. Most protocols include specific directions for dose modification due to toxicity.

In patients with chronic kidney or liver disease, metabolism and/or excretion of specific chemotherapeutic agents may be impaired. This results in prolonged exposure of normal tissues to the drugs and their metabolites and often causes an increase in frequency and severity of side effects. Drug doses may be decreased according to protocol guidelines to prevent toxicity in patients who have these medical conditions.

The bone marrow is the site of production of circulating blood cells: red blood cells (RBCs), which contain hemoglobin and transport oxygen to the tissues; white blood cells (WBCs), which fight infection and function in immunity; and platelets, which prevent bleeding when small blood vessels are injured. Bone marrow cells divide rapidly and are very sensitive to most antineoplastic agents, so that hematologic side effects are common in patients receiving these drugs. Toxicity may be expressed as decreases in one or more of the circulating blood cell types.

Most patients receiving chemotherapy develop a decrease in RBCs (**anemia**), reflected by a fall in laboratory measurements of hemoglobin or hematocrit. Anemia may be associated with generalized symptoms of fatigue and weakness, or it may exacerbate cardiovascular symptoms of shortness of breath (**dyspnea**) or congestive heart failure. Blood (RBC) transfusions are given if anemia becomes severe or symptomatic.

A decrease in platelet count (**thrombocytopenia**) may result in the appearance of small red-purple hemorraghic spots (**petechiae**), particularly on the skin of the lower legs and on the oral mucosa, large bruises (**ecchymoses**), or blood in the urine (**hematuria**). More serious internal hemorrhages may develop without apparent cause in patients with very low platelet counts. Platelet transfusions are usually given to patients with severe thrombocytopenia to prevent significant bleeding.

A decrease in the number of white cells (**leukopenia**), particularly in neutrophils which fight bacteria (**neutropenia**), makes the patient more susceptible to bacterial and fungal infections. WBC transfusions may be used in patients with life-threatening infections which are unresponsive to antibiotics.

The term **pancytopenia** is used when all blood cell lines are decreased.

Hematologic toxicity associated with chemotherapy for most cancers usually lasts seven to ten days at the most. However, induction therapy for acute leukemias, intensive chemotherapy for other widespread malignancies, and bone marrow transplantation often result in prolonged periods of pancytopenia. Patients undergoing these treatments require intravenous antibiotics and frequent transfusions of RBCs and platelets for hematologic support until bone marrow recovery occurs.

Gastrointestinal symptoms due to antineoplastic drugs may include nausea, vomiting, diarrhea, mouth ulcers (**stomatitis**), and irritation of the esophagus (**esophagitis**) or stomach lining (**gastritis**). Non-chemotherapeutic medications can be very effective in controlling these side effects. Gastrointestinal toxicity is usually short-lived (one to two days), but, in some situations, may be prolonged (five to six days).

Rapidly-dividing cells at the base of the hair follicles are also sensitive to chemotherapy. Thinning or loss of body hair (**alopecia**) occurs in many patients receiving chemotherapy. This is usually most pronounced on the scalp, but beard, axillary, pubic, and leg hair may also be affected. Hair growth resumes when chemotherapy is discontinued.

In both men and women, cells responsible for reproductive function may be affected by chemotherapy. In premenopausal women, menstrual cycles may become irregular or stop completely, and hot flashes may occur. Men may experience a decrease in the number of spermatozoa (**oligospermia**). Patients who complete chemotherapy may produce normal children; however, fertility may be reduced in long-term cancer survivors who have received chemotherapy.

Inflammation of the urinary bladder with bleeding into the urine (**hemorrhagic cystitis**) may occur with chemotherapeutic agents which are concentrated in the urine. Cyclophosphamide and ifosphamide are examples of drugs which may cause hemorrhagic cystitis. This complication may be prevented by increased fluid intake and/or by ancillary drugs which protect the bladder epithelium. Renal toxicity, manifested by increases in serum creatinine and blood urea nitrogen (BUN) and electrolyte imbalance, may be associated with cisplatin therapy.

Cardiovascular side effects are limited to specific agents. Antitumor antibiotics with anthracycline chemical structures, doxorubicin (Adriamycin) and daunomycin (Daunorubicin), can damage myocardial cells. Because congestive heart failure occurs more frequently in patients who receive high total doses of drug, a total dose limit is required in regimens containing these agents.

Pulmonary toxicity has been described in patients who receive long-term therapy with alkylating agents (busulfan, cyclophosphamide, and BCNU) and antitumor antibiotics (bleomycin and mitomycin). The development of pulmonary fibrosis may present as shortness of breath and has clinical findings of diffuse changes on chest x-ray and decreased oxygen diffusion on pulmonary function studies.

Fatigue and/or muscle weakness may result from anemia or from direct effects of the drugs on muscles or nerves. Patients receiving corticosteriods such as prednisone for prolonged periods may develop muscle weakness (myopathy), particularly involving the muscles of the upper arms and legs. Certain chemotherapeutic agents, such as the vinca alkaloids, cisplatin, and taxol, are associated with damage to the peripheral nervous system. The loss of sensation in the hands and feet (peripheral neuropathy) which develops in many patients receiving these drugs often improves with time when the agent has been discontinued.

Dermatitis associated with chemotherapy is uncommon. Patients receiving 5-fluorouracil by continuous infusion may develop redness and peeling of the skin on palms and soles (Hand/Foot Syndrome). Exfoliative dermatitis may be a dose-limiting toxicity of the drug PALA.

As more cancer patients achieve cure or prolonged survival, attention has focused on late sequelae of chemotherapy and problems of cancer survivors. Second primary malignancies related to treatment, such as acute non-lymphocytic leukemia in patients treated with alkylating agents, may occur years after completion of therapy. Current treatment plans attempt to decrease the potential for late complications whenever possible. For example, alternating cycles of MOPP and ABVD chemotherapy in patients with Hodgkin's disease reduces the total dose of alkylating agents and may decrease the risk of late sequelae.

Monitoring Tumor Response

Assessing response to therapy is of major importance both in day-to-day oncology practice and in clinical research. Many cancer patients will have **measurable disease**, tumor masses which can be measured in two dimensions on physical examination or by radiographic studies such as chest x-ray or CT scan. Other patients will have disease that can be evaluated objectively by examination or studies but cannot be measured directly; this is termed **evaluable disease**. Mediastinal tumors, in which widening of the mediastinum on chest x-ray reflects the extent of tumor involvement but distinct margins of the lesion cannot be determined clearly, are an example of evaluable disease. Some clinical trials require that participating patients have measurable disease, while others accept patients with evaluable disease.

A **complete response (CR)** occurs when the tumor mass resolves and there is no evidence of residual disease. A **partial response (PR)** shows definite improvement but disease remains present; specific criteria for partial response may vary from protocol to protocol. Other response categories of **stable disease** and **progressive disease** may be used to describe patients who do not achieve complete or partial responses. Response rates and duration of response are used to evaluate the efficacy of a particular regimen in a defined patient population.

The impact of a treatment is also evaluated by **overall survival** of treated patients and, for situations in which all clinically apparent disease is eradicated with treatment, by **disease-free survival** (time until relapse).

Recently, attention has been directed to the impact of cancer treatment, especially chemotherapy, on a patient's health-related **quality of life** (QOL). This construct represents the patient's physical and mental well-being. For the cancer patient, QOL includes physical performance, emotional and psychologic function, social interactions, and symptoms of disease. QOL is now measured as an outcome in many cancer treatment clinical trials. It is an especially important consideration when treatments have similar response rates and survival but different toxicities, or when one treatment has improved survival but has more severe side effects.

Multimodality Approach to Cancer Therapy

Chemotherapy may be administered with other treatment modalities such as surgery and radiation therapy in an organized treatment plan. This approach is called **multimodality therapy** or **combined modality therapy**. Administration of chemotherapy may precede or follow surgery or radiotherapy; in some cases, chemotherapy or hormonal therapy may be administered during radiation therapy. The use of chemotherapy or hormonal therapy immediately following surgery for early stage breast cancer, all as a part of the initial course of treatment, is an example of combined modality therapy.

Many patients who appear to have localized cancers at diagnosis will develop recurrence at sites distant from that of the original surgery. These patterns of recurrent disease suggest that micrometastases were present at diagnosis but could not be detected clinically. In early stage breast cancer and colon cancer, administration of chemotherapy *following initial surgery* can prolong disease-free survival and overall survival. Chemotherapy administered following surgical resection in patients without clinically demonstrable disease is called **adjuvant chemotherapy**.

In certain situations, chemotherapy has been used to reduce the bulk of a locally advanced primary cancer *prior to surgical resection or radiotherapy*. This approach is called **neoadjuvant (or primary) chemotherapy**. The role of neoadjuvant chemotherapy in management of head and neck carcinomas, lung cancer, esophageal malignancies, and locally advanced breast cancer is currently under investigation.

Progress in Cancer Treatment with Chemotherapy

Although chemotherapy is a relatively new modality in cancer treatment, antineoplastic agents are used at some time during treatment in most patients with cancer. The development of effective combination chemotherapy regimens has made cure possible in many patients with advanced disease and has delayed tumor recurrence and prolonged survival in many patients with early stage cancer.

The following table summarizes advances in cure of advanced cancer with chemotherapy in both adult and pediatric malignancies.

Curability of Disseminated Cancer with Chemotherapy

Disease	Therapy	Cure Rate
Adults		
Diffuse histiocytic lymphoma (Stages III and IV)	CTX	$\geq$ 50%
Hodgkin's disease (Stages III and IV)	CTX	$\geq$ 50%
Testicular carcinoma (Stage III)	CTX $\pm$ SURG	$\geq$ 75%
Gestational choriocarcinoma	Methotrexate $\pm$ actinomycin D	90%
Ovarian carcinoma	Alkylating agents or CTX	10 - 20%
Acute myelocytic leukemia	CTX	20%
Children		
Acute lymphocytic leukemia Non-Hodgkin's lymphoma	CTX + cranial XRT	$\geq$ 50%
Burkitt's lymphoma	Cyclophosphamide or CTX	$\geq$ 50%
Wilms's tumor Childhood sarcomas	SURG, CTX, XRT	$\geq$ 50%

CTX=Combination chemotherapy; SURG=Surgery; XRT=Radiation therapy

Adapted from: Chabner BA, Collins JA. Cancer Chemotherapy: Principles and Practice. JB Lippincott Company, New York, 1990.

CHEMOTHERAPEUTIC DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Acivicin		Antibiotic AT-125, U-42,126	163501
Aclarubicin	ACM, ACR, ACM-A	Aclacinomycin, Aclacinomycin-A#, Aclacinon, Aclarubein, Antibiotic MA, 144 A1 (anthracycline)	208734
Acodazole (HCl)	AD-32	EU-3120	305884
Acronine*		Acronycin#, Acronycine, Compound 42339	403169
Adozelesin		U-73,975	
Alanosine		L-Alanosine (antitumor antibiotic)	153353
Alpha-TGdR		Deoxythioguanosine hydrate, Thioguanosine deoxyriboside	071851
Altretamine*	HMM	ENT 50852, Hemel, Hexalen (see Hexamethylmelamine)	013875
Ambomycin		Antitumor antibiotic	053397
Ametantrone Acetate	CI-881	287513	
Aminopterin	APGA	Aminopteridine, Aminopterin sodium, A-Minopterin, ENT 26079 (antimetabolite)	000739
Aminothiadiazole	ATDA, A-TD	TF-128, 2-Amino-1,3,4-thiadiazole	004728
Amsacrine	AMSA, m-AMSA	Acridinyl anisidide, Amsidyl, CI-880 (miscellaneous agent)	249992
Anguidine	ANG, DAS	ANG 66, Anguidin, Diacetoxyscirpenol	141537
Aniline mustard		Lymphochin, Lymphocin, Lymphoquin, TL 476	018429
Anthramycin		Antramycin, 2-Propenamide	
Anthrapyrazole C 1941			
Aphidicolin Glycinate		Aphidicolin-17 glycinate, ICI 137233	303812
Asaley		Asalex	167780
Asperlin#		U-13,933	093158
5-Aza-2'Deoxy-cytidine	DAC		
8-Azaguanine	Azan 8-AG, AZG	Azaguanine, B-28, Guanazol, Guanazolo, Pathocidin, Pathocidine, SF-337	000749
Azapicyl			
Azaribine*	AZR	6-Azauridine triacetate, CB 304, Triazure#	067239

CHEMOTHERAPEUTIC DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Azaserine*#	AZAS, AZS	Azaserin, CI 337, CN 15,757, Diazoacetylserine, L-Serine diazo-acetate ester, P-165 (antimetabolite)	000742
Azathioprine*	ATP, AzAT	Azanin, Azathioprin, Azatioprin, Azothioprine, BW 57-322, Imuran, Imurek, Imurel, Muran	039084
Azetepa#		Azatepa, CL-25477, Thiatriamide	064826
Azidothymidine	AZT	3'-Azido-3' Deoxythymidine, BW A 509U, Retrovir, Zidovudine (used in treatment of Kaposi's sarcoma only)	602670
Azotomycin	AZOT	Duazomycin-B, Antibiotic 1719	056654
6-Azuridine	AzUR	6-Azauracil riboside, Azauridine, 6-Azur, 6-Azauridine, Ribo-azauracil, Ribo-azuracil, Riboazuracil	032074
Baker's antifol	BAF, TZT	Baker's antifolante, Ethanesulfonic-acid compound, Triazinate	139105
Benzodepa		AB-103, Benzcarbimine, Dualar#, ENT-50451	037096
Beta-TGdR	BTGR, TGdR	Thioguanine deoxyriboside, B-2' Deoxythioguanosine	071261
Bisantrene (HCl)	ADAH, ADC	Bisantrene, CL-216,942, Orange-Crush# (anthracene derivative)	337766
Bleomycin Sulfate	BLEO, BLE, BLM	Blenoxane, Bleomycin, NDC 0015-3010 (antitumor antibiotic)	125066
BMY-45622			
Brequinar Sodium		Dup 785	368390
Bromacrylide#		2-Propenamide	066248
Bropirimine		U-54,461	
Bruceantin	BRU		165563
Bryostatin			339555
Busulfan*	BSF, BU, BUS, BUSU	Busulphan, Joacamine, Mablin, Misulban, Mitostan, Myelosan (Russia), Mylecytan, Myleran (alkylating agent)	000750
BW A 773U		Crisnatol	
Cactinomycin		Actinochrysin, Actinomycin C#, H.B.F. 386, Sanamicia, Sanamycin, Sandamycin, (antitumor antibiotic)	018268
Camptothecin	CAMP	Camptothecine sodium	100880
Caracemide			253272

CHEMOTHERAPEUTIC DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Carbetimer		N-137	
Carboplatin*	CBDCA	JM-8, Paraplatin,	241240
Carmustine*	BCNU	BiCNU, Carmustinea, (nitrosourea) (alkylating agent)	409962
Carubicin (HCl)	CMM	Carminomicin I, Carminomycin, Carminomycin HCl#, Carminomycin I, Carubicin, Karminomitsin, Karminomycin HCl	275649 180024
CB-10-277			208107
2-CdA		2-Chloro-2'Deoxyadenosine, Cladribine, Leustatin	105014
Chlorambucil*	CHL, CLB	Ambochlorin, CB-1348, Chloraminophene, Chlorbutin, Chlorbutine, Ecloril, Leukeran, Leukersan, Leukoran, Linfilizin, Linfolysin (alkylating agent)	003088
Chlorozotocin	CLZ, CZT, DCNU	SRI 5244 (analog of Streptozocin)	178248
Chlorsulfaquinoxaline	CQS	Chloroquinoxaline sulfonamide	339004
Chromomycin A3#		Aburamycin B, Antibiotic B 599, Toyamicin, Toyomycin	058514
CI-921			343499
CI-937			
Cilastatin Sodium		Component of Primaxin (antibiotic)	
Cirolemycin*		U-12,241	077950
Cisplatin*	CACP, CPPD, Cis-DDP, CPD, CPDC, CPDD, DDP	Cis-Diamminedichloroplatinum (II), Cis-Platin, Cisplatino (Spanish), Cis-Platinum II#, Cisplatyl, Neoplatin, Peyrone's chloride, Platinex, Platinol, Platinum (miscellaneous agent)	119875
Clomesone			338947
Colcemid		Alkaloid H-3, C-12669, Colcemide, Colchamin, Colchicine, Deacetyl-N-methylcolchicine, Demecolcine, Desacetylmethylcolchicine, Desmecolcine, Kolchamin, Kolkamin, Omain, Omaine, Santavy's Substance F, Substance F (Reichstein's)	003096
CPT-11			
Crisnatol mesylate		BW A770U mesylate	
Cyclocytidine (HCl)	CYC,	Cyclo-C Ancitabine hydrochloride, Ancytabine, CycloCMP hydrochloride (miscellaneous agent)	145668

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Cyclodisone			348948
Cyclohexanecarboxamide		Aziridinyl cyclohexane, Ba 24648	051915
Cycloleucin	ACPC, CL, CYL	Cycloleucine, CB 1639, WR 14997	001026
Cyclopentenyl-cytosine	Ce-Cyd, CPE-C		375575
Cyclophosphamide*	CP, CPM, CTX, CTY, CYC, Cyclo, CYT, CYTOX, CYTX	Asta B 518, Clafen, Claphene, Cyclophosphamid, Cyclophosphan, Cyclophosphane, Cytophosphan, Cytoxan, Endoxan, Endoxana, Enduxan, Genoxal, Neosar, Procytox, Sendoxan, Tymtram (alkylating agent)	026271
Cytarabine* (HCl)	Ara-C, CA, HDA, HDARA-C	AC-1075, Alexan, Arabinocytidine, Ara-cytidine, Beta-Arabinosylcytosine, Cytarabin, Cytarabinoside, Cytosine arabinoside hydrochloride#, Spongocytidine HCL, U-19920A (antimetabolite)	063878
Cytembena	CTB	MBBA, Mebryl (Czechoslovakia), sodium bromebrate	104801
CQS		See Chlorsulfaquinoxaline	339004
Dacarbazine*	DIC, DTIC, ICDT, ICT	Dimethyl-triazeno-imidazole-carboxamide, DTIC-Dome, (antimetabolite)	045388
Dactinomycin*	ACD, ACT, ACT-D, ACTD, Acto-D, AD, Dact	Actinomycin AIV, Actinomycin C1, Actinomycin D, Actinomycindioic D-acid dilactone, Actinomycin I1, Actinomycin IV, Cosmegan, Dactinomycin D, Meractinomycin, Oncostatin K (antitumor antibiotic)	003053
Daunorubicin (HCl)*	Daun, Dauno, DNM, DNR, DRB	Acetyladriamycin, Cerubidine, Daunoblastin, Daunomycin, Daunomycin-HCl, Daunorubicin, Daunorubicine, Leukaemomycin C, NDC-0082-4155, RP-13057, Rubidomycin-HCl, Rubomycin C (antitumor antibiotic)	082151
3-Deazauridine	DAU	Deazauridine, EO-26	126849
Decitabine	DAC		127716
Deoxydoxorubicin HCl	DxDx, 4-DxDx	4'-Deoxyadriamycin hydrochloride, 4'-Deoxydoxorubicin, Esorubicin HCl, 1-Dox, IMI 58	267469
Deoxyspergualin HCl		15-Deoxyspergualin trihydrochloride, Heptanamide	356894
Detorubicin	DTR		
Dexormaplatin		U-78,938	

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Dexrazoxane		ADR-529, ICRF-187	169780
Dezaquanine		CI-908	261726
Dezaguanine Mesylate		CI-908 mesylate, PD 90,695-73	
DFMO	DFMO (HCl)	Alpha-DFMO HCl, Alpha-Difluoromethyl-ornithine, Difluoromethylornithine	337250
DHAC		5,6-Dihydro-5-azacytidine hydrochloride, Dihydroazacytidine	264880
Dianhydrodulcitol	DAG	Dianhydrogalactitol, Dulcitol-diepoxide, Galactitol (miscellaneous agent)	132313
Diaziquone	AZQ	Aziridinyl Benzoquinone, CI 904 (quinone derivative)	182986
Dibromodulcitol	DBD	Dibromdulcit, Elobromol, Mitolac, Mitolactol (miscellaneous agent)	104800
Dibromomannitol	DBM	Dibromannit, Mielobromol, Mitobron-itol, Myebrol, Myelobromol (alkylating agent)	094100
Dichloroallyl lawsone	DCL	Dichlorolapachol	126771
Dichlorometho-trexate	DCM, DCMTX	Dichloroamethopterin, DichloroMetho-trexate	029630
Didemnin B			325319
Diglycoaldehyde	INOX, STGDR	Inosine dialdehyde, Wy-5321	118994
Dihydrolenperone		Dihydro-lenperone	343513
DON		6-Diazo-5-Oxo-L-Norleucine (9CI)	007365
Doxorubicin (HCl)*	ADM, ADR, ADRI, Adri	Adriamycin, Adriamycin-TM, Adri-blastina (Italy), FT-106, 14-hydroxy-daunomycin, Rubex (antitumor antibiotic)	123127
Doxorubicin-DNA complex			
Duazomycin		(N-Acetyl DON)	051097
Duborimycin			
Echinomycin		Quinomycin A	526417
Edam-10			626715
Edatrexate		CG 30694	
Eflornithine HCl		DFMO, MDL 71,782A, Ornidyl	
Elsamitrucin		BBM-2478A, BMY-28090	
Emetine	EMET	Emetin, Emetine monohydrochloride	033669

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Emofolin (sodium)	MeTHHF	Homofolic acid, 5-Methyltetrahydro-homofolate disodium	139490
Enpromate#		59156	112682
Epipropidine#		Eponate, Epoxypropidine, LY 28002	056308
Epirubicin (HCl)	EPI	IMI-28, Pharmorubicin	259642
Ethidium chloride		Babidium chloride, Homidium chloride, Novidium chloride	084423
Ethoglucid		Epodyl, Etoglucid, ICI-32865	080439
9-Ethyl-6-Mercaptopurine		9-Ethyl-6-MP, 79T61	014575
Etoposide*	EPEG, VP-16, VP-16-213	Epipodophyllotoxin ethylidene gluco-pyranoside, Ethylidine-Lignan-P, Podophyllotoxin derivative, Vepesid (plant alkaloid)	141540
Etoprine			
Fadrazole HCl		CGS-16949A	
Fazarabine	Ara-AC	5-azocytosine arabinoside, Kymarabine	281272
Fenretinide		McN-R-1967	
Flavone acetic acid	FAA, FVA	Flavone-8-Acetic Acid	347512
F3TDR		Trifluorothymidine, Trifluridine	075520
Floxuridine*	FUDR, 5-FUDR, 5-FURD	Floxuridin, 5-Fluorouracil deoxyriboside, 5-Flurodeoxyuridine, FUDR (antimetabolite)	027640
Fludarabine Phosphate	2-FAMP	Fludara, 2-Fluoroadenine arabinoside-5-Phosphate, 2-Fluoro-ARA AMP	312887
2-Fluoroadenosine#	2 FAS	SRI-727	030605
Fluorodopane		Fluorodopan, Fluorpan	073754
Fluorouracil*	5-FU, FU	Adrucil, Efudex, Fluoroplex, 5-Fluorouracil, Fluracil, 5-Fluracil, Fluril, Oracil, Ro 2-9757 (fluorinated pyrimidine) (antimetabolite)	019893
Flurocitabine#		AAFC, Ro 21-0702	
Fosquidone		GR 63178K	
Fostriecin Sodium		Antibiotic CI-920, Antibiotic CL 1565A, Pyranone Phosphate	339638
Fotemustine			
Ftorafur		See Tegafur	148958

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Gemcitabine		LY188011	
Gemcitabine HCl		LY188011 hydrochloride	
GR 63178A			
Guanazole		3,5-Diamino-s-triazole	001895
Hepsulfam		1,7-Heptanediylsulfamate (ester)	329680
Hexamethylmelamine	HMM, HXM	See Altretamine	013875
Homoharringtonine	HH		141633
Hycanthone (mesylate)		Etrenol, Hycanthone methanesulfonate, Hycanthone monomethanesulfonate	142982
5-Hydroxypicolinaldehyde thiosemicarbazone	5-HP		107392
Hydroxyurea*	HU, HUR, HYD	Carbamohydroxamic acid, Carbamohydroximic acid, Carbamoyl oxime, Hidrix, Hydrea, Hydreia, Hydroxycarbamide, Hydroxycarbamine, Hydroxylurea, Hydura, Litaler, Litalir, Onco-Carbide, Oxyurea, SQ 1089 (miscellaneous agent)	032065
ICRF-187		See Dexrazoxane	169780
Idarubicin HCl*	4-DMDR, IDA	4-Demethoxydaunorubicin, Idamycin, IMI-30	256439
Ifosfamide*	IFX, IPP	A-4942, Asta Z-4942, Cyfos#, Holoxan 1000, Ifex, Ifosfamid, Iphosphamid, Iphosphamide, Isoendoxan, Isofosfamide, Isophosphamide, Mitoxana, MJF 9325, Naxamide#, Z-4942 (alkylating agent)	109724
Ilmofosine		BM 41,440	
Imipenem		Imipemide#, component of Primaxin (antibiotic)	
Indicine-N-oxide	INDI, INO		132319
Inproquone		E-39, Inprochone, RP-6870	017261
Iproplatin		CHIP, JM-9, 2-Propanimine, Platinum-complex (9CI)	256927
JB-11			249008
Liposome-Doxorubicin Kit		(TLC-Dox 99)	620212
Lometrexol Sodium		LY 264618 disodium	
Lomustine*	CCNU	Belustine (nitrosourea), CeeNU, Chloroethylcyclohexylnitrosourea, ICIG 1109 (alkylating agent)	079037
Lovastatin		Mevacor, Mevinolin#	

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
M-Azido-Pyrimethamine Ethane Sulphonate			
Mafosfamide		Mafosfamide L-lysine	626122
Magnamycin		Carbomycin, Carbomycin A, Deltamycin A4, Magnamycin A (antibiotic)	051001
Mannosulfan		R-52, Zitostop	201289
Marcellomycin			265211
Masoprocol		Actinex, CHX 100, meso-NDGA	
Maytansine	MTS	Ansamacrolide compound (natural product)	153858
Mechlorethamine (HCl)*	HN2, NH2, NH2-HCl	Chloromethine-HCl, Dichloromethyldiethylamine-HCl, Mechlorethamine, Mustargen, Mustargen-HCl, Mustine, NH2 Nitrogen Mustard (alkylating agent)	000762
Melphalan* (HCl)	L-PAM, MPL, PAM	Alanine mustard, Alkeran, CB-3025, DL Sarcolysine, L-Phenylalaninemustard, L-Sarcolysin, Melfalan, Nitrogen mustard, Sarcolysine, Sarkoklorin, Sarkolizin (alkylating agent)	008806
Menogaril	MEN	7-OMEN, Tomosar, U-52,047	269148
Merbarone		5-Carboxyanilino-2-thiobarbituric acid	336628
Mercaptopurine*	6-MP, MP	Ismipur, Leukerin, Leupurin, Mercaleukin, 6-Mercaptopurin, 6-Mercaptopurine, Mercapurin, Mern, Purinethiol, Purinethol, 6-Thiohypoxanthine, 6-Thiopurine, 6-Thioxopurine (antimetabolite)	000755
6-Mercaptopurine riboside	6-MPR	6-Mercaptoinosine, 6-Mercaptopurineribonucleoside, 6-Thioinosine	004911
MeTHHF		See Enfolin sodium	139490
Methotrexate*	MTX	Amethopterin#, Antifolan, CL-14377, Folex, Methotrexate sodium, Mexate, Mexate AQ, R 9985, Rheumatrex (antimetabolite)	000740
Methyl CCNU		See Semustine	095441
Methyl-G	MeG, MeGAG, MGA, MGBG, MGGH	Methyl-GAG, Methylglyoxal bisguanylhydrazone dihydrochloride monohydrate, Mitoguazone, Mitoguazone dihydrochloride	032946
Methyl methanesulphonate		Methyl methanesulfonate, Methylmethane sulfonate	050256
Methylene Dimethane Sulfonate			

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
6-Methylmercapto-purine riboside	6-MMPR	6-Methyl MP-riboside, Methylthioinosine, 6-Methylthiopurine riboside, SQ 21,977 (biochemical modulator)	040774
Metoprine	DDMP	Delcronol (antimetabolite)	007364
Meturedepa		AB-132, Dimethylurethimine, Turloc	051325
Miltefostine	He-PC	Hexadecylphosphocholine	
Mithramycin		Plicamycin	
Mitindomide		CAS 10403-51-7	284356
Mitocarcin		24281 (antibiotic)	
Mitoclomine			114575
Mitocromin		B 35251 (antibiotic)	077471
Mitogillin			069529
Mitoguazone		See Methyl G	
Mitomalcin		Antibiotic	113233
Mitomycin*	MITC, Mito, MITO-C MMC, MTC	Ametycine, Mitocin-C, Mitomycin-C, Mutamycin (alkylating agent)	026980
Mitopodozide		2-ethylhydrazide, Podophyllic acid, Proresipar, SP-I 77	072274
Mitosper		31595C	117032
Mitotane*	o.p'-DDD, o.p'-DDE	CB-313, Chloditan, Chlodithane, Lysodren, Mitotan (miscellaneous agent)	038721
Mitoxantrone (HCl)*	DHAD, DHAQ	CL-232,315, Dihydroxyanthracene-dione dihydrochloride, Novantrone	301739
Mitozolomide		Azolastone	353451
Mopidamol		RA-233	
Nafazatrom		BAY G6575	
Nafidimide	BIDA	Amonafide, Amonafide HCL (NSC 621093), Benzisoquinolenedione	308847
Nitrofurazone		Furacin	
Nocodazole (Belgium)		R 17,934	238159
Nogalamycin#		U-15167	070845
Novatrone		Synthetic antineoplastic anthracenedione	
Oxisuran*#		W-6495	356716

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Paclitaxel		Taxol	125973
PALA		CI-882, N-Phosphonacetyl-L-Aspartate disodium, Sparfosate Sodium (miscellaneous agent)	224131
Pancratistatin			349156
PCNU		Nitrosourea	095466
Peliomycin		Oligomycin B (antibiotic)	076455
Penberol			
Penclomidine			338720
Pentamethyl-melamine HCl	PMM		118742
Pentamustine	NCNU	Salisburystin	324595
Pentosan Polysulfate Sodium		Pentosan sulfate	626201
Peplomycin Sulfate		NK 631, Pepleomycin	
Peptochemio	PTC		
Phenesterine		Fenesterin, Fenestrin, Phenesterin, Phenestrin	104469
Phetharbital		Fedibaretta, N-Phenylbarbitol, Phenidiemal, Pyrictal	085043
Phosphoramide mustard#	PDA	Phosphamide	069945
Photofrin II		See Porfimer Sodium	603062
Phyllanthoside			328426
Pibenzimol HCl		Bisbenzamide, Bisbenzimidazole, Hoechst No. 33258	322921
Piperazinedione compound	PZD	Actinomycete fermentation product, Compound 593A, Crystalline antibiotic (miscellaneous agent)	135758
Pipobroman*	PIBR	A-8103, Amedel, Vercyte (alkylating agent)	025154
Piposulfan	PISU	A-20968, Ancyte#	047774
Piroxantrone HCl		Anthrapyrazole Dihydrochloride, Oxanthrazole, Oxantrazole HCl	349174
Plicamycin*	MITH, MTH	A-2371, Antibiotic LA 7017, Aureolic acid, Mithracin, Mithramycin#, PA-144 (antitumor antibiotic)	024559
Porfimer Sodium		Dihematoporphyrin Ether, Photofrin II, Photofrin, CL 184,116	

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Porfiromycin	PORF	ENT-50825, N-Methylmitomycin C, Porfiromycine, Regamycin#, U-14,743	056410
Prednimustine		Sterecyt	
Procarbazine* (HCl)	IBZ, MIH, PCB, PCH, PCI, PCZ	Ibenzmethyzin hydrochloride, Matulane, Methylhydrazine, Natulan, Ro4-6467/1 (miscellaneous agent)	077213
Puromycin (HCl)		CL-16,536, P-638, Puromycin, Stillomycin, Stylomycin, 1-MM, 3123L	003055
Pyrazine diazohydroxide		Sodium N-Nitroso-Pyrazinamine	361456
Pyrazofurin#	PRZF, PZF	Antibiotic A 23813, Pirazofurin, Pyrazomycin, 47599	143095
Pyrazoloacridine			366140
Pyrazolo-Imidazole compound	IMPY	Pyrazolo (2,3-a) imadazolidine	051143
Razoxane		ICI-59118, ICRF-159, Tepirone	129943
Rhizoxin	RZN		332598
Riboprine*	IPA	SQ 22558	105546
Rifampin		Ba 41166/E, L-5103, Rifadin, Rimactane (antibiotic)	113926
Rubidazone		See Zorubicin hydrochloride	164011
Selenium			
Semustine	MCCNU, MCNU, MeCCNU	Methyl CCNU, Methylcyclohexyl nitrosourea, trans-Methyl CCNU	095441
Simtrazene#		Centrazene, CL 26193	083799
Sparfosate Sodium		See PALA	224131
Sparsomycin		U-19183	059729
Spirogermanium (HCl)	SPG	Spiro-32	192965
Spiromustine		Spirohydantoin mustard# (alkylating agent)	172112
Spiroplatin		TNO-6	311056
SR 2508		See Ancillary drugs	
Streptonigrin	SN, STN, STP	Bruneomycin, Methyl streptonigrin, Nigrin, Rufochromomycin, Rufocromomycin, 5278 R.P.	045383
Streptozocin	STR, Strept, STZ, SZ, SZC	Streptozoticin, Streptozotocin, U-9889, Zanosar, (nitrosourea) (alkylating agent)	085998

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Strontium			
Sulofenur		LY 186641	
Suramin Sodium		Antrypol, Bayer 205, Fourneau 309, Germanin, Moranyl, Naganin, Naganol, Naphuride Sodium, Sodium Suramin	034936
Talisomycin		BU-2231A, Tallysomycin A#	
Taxol		(See Paclitaxel)	
Taxotere			
Tazobactam		YTR 830, (antibiotic, beta lactamase inhibitor)	
TCN		See Triciribine phosphate	280594
Tegafur	FT	Florafur, Fluaid, Fluorofur, FT-207, Ftorafur, Futraful, MJF-12264	148958
Teniposide	EPT, PTG	Epipodophyllotoxin, Thenylidene, Thenylidine-Lignan-P, Vee M-26, Vehem, VM-26, Vumon (plant alkaloid)	122819
Terephthalamidine		N,N'- bis (p-N'- methylamidinolphenyl-) terephthalamidine 4 HCl, Symetamine	057155
Teroxirone		Alpha TGI, Glycidyl isocyanurate, Henkel's compound, Triazinetrione-triepoxide, XB 2615	296934
D-Tetrandrine		Tetrandirine, Tetrandrin	077037
Tetraplatin		Ormaplatin, U-77,233	363812
Thalicarpine	TC	Taliblastine, Thaliblastine, Thalicarpin	068075
Theprubicin	THP		
Thiamiprine	ITG	BW-57-323, Guaneran, Tiamiprine	038887
Thioguanine*	TG, 6-TG, TT-6, TT-G	6-Mercaptoguanine, Tabloid, 6-Thioguanine, Tioguanin (antimetabolite)	000752
Thiotepa*	STEPA, TESP, TESPA, Thio-TEPA, TSP, TSPA	Oncotepa, Oncotiotepa, Tespa, Tespamin, Tespamine, Thiofozil, Thiophosphamide, Thiotef, Thio-Tepa, Thiotepa, Tifosyl, Tiofosfamid, Tiofosyl-(Sweden), Tiofozil, Tio-TEF, Triethylene thiophosphoramide (alkylating agent)	006396
Thymidine	DT, DThyd, TdR	Deoxythymidine, 5-Methyldeoxyuridine, Thymidin, Thymine deoxyriboside	021548
Tiazofurin	TCAR	CI-909, Riboxamide	286193

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
TIC-mustard	BIC, BTIC, TIC	Imidazole mustard, Imididazole-carboximide, TIC NH2 (misc. agent)	082196
Timp-2			
TMCA	TNCA	Citostal, Methyl ether, Trimethylcolchicinic acid, methyl ester, L-tartrate (1:1)	036354
Topotecan HCl		Hycamptamine, SKF 104864-A	609699
Toyocamycin		Antibiotic 1037, Antibiotic E 212, Toyokamycin, Unamycin B, Vengicide	063701
Treosulfan			
Triazinate		See Baker's antifol	139105
Triazine antifol			127755
Triciribine Phosphate	TCN, TCN-P	Tricyclic nucleoside 5'-phosphate#, Tricycloside phosphate	280594
Triethylenemelamine	TEM, TET	Ho 1/193, M-9500, Persistol, R-246, SK-1133, Tretamine, Triamelin (alkylating agent)	009706
Triglycidylurazol	TGU	Anaxirone	332488
Trimetrexate	TMTX	CI-898, Trimetrexate glucuronate	352122
Trityl cysteine		S-trityl-L-cysteine, Tritylthio-alanine	083265
Trofosfamide			
Tubercidine		Antibiotic XK 101-1, Aplisol, 7-Deaza-adenosine, Sparsomycin A, Tubercidin, U-10071, 12,540	056408
Uracil Mustard*	UHN2	U-8344, Uracil, Uramustin, Uramustine (alkylating agent)	034462
Uredepa		AB-100, Avinar#, Urethimine	037095
Urethane		Ethyl carbamate#	000746
Uridine		Uracil riboside, Urd, Uridin	020256
Vapreotide		BMY-41606, RC-160	
Vidarabine*	Ara-A	Adenine arabinoside, Ara-adenosine, Arabinosyladenine, CI-673, Spongo-adenosine, Vidarabin, Vidarabin-Thilo, Vira-A, Vitarabin, Vitarin	404241
Vinblastine* Sulfate	VBL, VELB, VLB	Velban, Vinblastine, Velsar, Vinca-leukoblastine sulfate, 29060-LE (vinca plant alkaloid) (mitotic inhibitor)	049842

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Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Vincristine* Sulfate	LCR, VCR, VNCR	Leurocristine sulfate, Oncovin, Vincaleukoblastine, Vincasar, Vincristine, Vincrystine, Vinkristin, 37231 (vinca plant alkaloid) (antimetabolite)	067574
Vindesine		Compound 112531	
Vindesine Sulfate	DAVA, DVA	Desacetylvinblastine amide sulfate, Eldisine, LY-099094	245467
Vinepidine Sulfate		LY 119863	
Vinglycinate Sulfate		49040	
Vinleurosine Sulfate#		Leurosine, Vinleurosine, 32645	528004
Vinorelbine	VNB	Navelbine	
Vinrosidine Sulfate#		Leurosidine sulfate, 3678l	
Vinzolidine Sulfate	VZL	LY-104208 (vinca plant alkaloid derivative)	
WR 2721		See Ancillary drugs	
Yoshi-864			102627
Zeniplatin		CL 286,558	
Zidovudine*	AZT	See Azidothymidine	602670
Zinostatin	NCS, NZS	Neocarcinostatin, Neocarzinostatin#, Vinostatin	157365
Zorubicin (HCl)	RBD, RUB	Benzoyl hydrazone daunorubicin, RP-22,050, Rubidazone, Rubidazone-hydrochloride	164011

COMBINATION REGIMENS

There are many combinations of antineoplastic drugs and hormones in general use. Teaching institutions are continuously establishing and testing protocols using new combinations of drugs. Listed in this segment are a few combinations so that you will understand how these combinations are named. As a registrar you should familiarize yourself with the antineoplastic drugs used in your hospital's oncology department to ensure the proper identification of its drug combinations.

ABVD	Adriamycin, Bleomycin, Vinblastine, Dacarbazine
AcFuCy	Actinomycin, 5-Fluorouracil, Cyclophosphamide
ADOC	Adriamycin, DDP, Oncovin, Cyclophosphamide
BACOP	Bleomycin, Adriamycin, Cyclophosphamide, Oncovin, Prednisone
B-CAVe	Bleomycin, CCNU, Adriamycin, Vinblastine
B-DOPA	Bleomycin, Dacarbazine, Oncovin, Prednisone, Adriamycin
CAF	Cyclophosphamide, Adriamycin, 5-Fluorouracil
CAMF	Cyclophosphamide, Adriamycin, Methotrexate, 5-Fluorouracil
CAMP	Cyclophosphamide, Adriamycin, Methotrexate, Procarbazine
CAP	Cyclophosphamide, Adriamycin, Cisplatin
CAV	Cyclophosphamide, Adriamycin, Vincristine
CAVV	Cyclophosphamide, Adriamycin, Vincristine, VP-16
CCVPP	CCNU, Cyclophosphamide, Vincristine, Procarbazine, Prednisone
CFP	Cyclophosphamide, 5-Fluorouracil, Prednisone
CHAD	Cyclophosphamide, Hexamethylmelamime, Adriamycin, DDP
CHAP	Cyclophosphamide, Hexamethylmelamine, Adriamycin, Cisplatin
ChlVPP	Chlorambucil, Vinblastine, Procarbazine, Prednisone
CHOP	Cyclophosphamide, 14-Hydroxydaunomycin (Adriamycin), Oncovin, Prednisone
CMC	CCNU, Methotrexate, Cyclophosphamide
CMF	Cyclophosphamide, Methotrexate, 5-Fluorouracil
CMFVP	Cyclophosphamide, Methotrexate, 5-Fluorouracil, Vincristine, Prednisone
COAP	Cyclophosphamide, Oncovin, Adriamycin, Prednisone
C-MOPP	Cyclophosphamide, Methotrexate, Oncovin, Procarbazine, Prednisone
COM	Cyclophosphamide, Oncovin, Methotrexate
COMLA	Cyclophosphamide, Oncovin, Methotrexate, Leucovorin rescue, Ara-C
COMP	Cyclophosphamide, Oncovin, Methotrexate, Prednisone
COP	Cyclophosphamide, Oncovin, Prednisone
COP-BLAM	Cyclophosphamide, Oncovin, Prednisone, Bleomycin, Doxorubicin, Procarbazine
CVP	Cyclophosphamide, Vincristine, Prednisone
Cyta BOM	Vincristine, Methotrexate and citrovorum factor

COMBINATION REGIMENS (Cont'd)

CYVADIC	Cyclophosphamide, Vincristine, Adriamycin, Dacarbazine
DDP-CHAD	DDP, Cyclophosphamide, Hexamethylmelamine, Adriamycin, DDP
DDP-MECY	DDP, Methotrexate with Leucovorin rescue, Cyclophosphamide
DVB	Cisplatin, Vindesine, Bleomycin
DVM	Cisplatin, Vindesine, Methyl G
D-ZAPO	Daunorubicin, 5-Azacytidine, Ara-C, Prednisone, Oncovin
EBAP	Eldisine, BCNU, Adriamycin, Prednisone
FAC	5-Fluorouracil, Adriamycin, Cyclophosphamide
FACP	5-Fluorouracil, Amethopterin, Cyclophosphamide, Prednisone
FAM	5-Fluorouracil, Adriamycin, Mitomycin
FEC	5-Fluorouracil, Epirubicin, Cyclophosphamide
FOMi	5-Fluorouracil, Oncovin, Mitomycin
HEXA-CAF	Hexamethylmelamine, Cyclophosphamide, Amethopterin, 5-Fluorouracil
MABOP	Mechlorethamine, Adriamycin, Bleomycin, Oncovin, Prednisone
MACC	Methotrexate, Adriamycin, Cyclophosphamide, CCNU
MACE	Methotrexate, Adriamycin, Cyclophosphamide, Etoposide
MACOP-B	Methotrexate, Doxorubicin, Cyclophosphamide, Vincristine, Prednisone, Bleomycin
MAID	Mesna, Doxirubicin, Ifosfamide, DTIC
M-BACOD	Methotrexate, Bleomycin, Adriamycin, Cyclophosphamide, Oncovin, Dexamethasone
MMV	Mitomycin, Methotrexate, Vincristine
MOF	Mitomycin or MeCCNU, Oncovin, 5-Fluorouracil
MOF-S	MeCCNU, Oncovin, 5-Fluorouracil, Streptozotocin
MOPP	Mechlorethamine, Oncovin, Procarbazine, Prednisone
MTX-CF	Methotrexate with citrovorum factor rescue
MVAC	Methotrexate, Vinblastine, Adriamycin, Cisplatin
PAC	Cisplatin, Adriamycin, Cyclophosphamide
PEB	Cisplatin, Etoposide, Bleomycin
POC	Procarbazine, Oncovin, CCNU
POMP	6-Mercaptopurine, Oncovin, Methotrexate, Prednisone
PRO-MACE	Prednisone, Methotrexate, Adriamycin, Cyclophosphamide, Epipodophyllotoxin,
ProMACE-MOPP	Prednisone, Methotrexate, Adriamycin, Cyclophosphamide, Epipodophyllotoxin, followed by Mechlorethamine, Oncovin, Procarbazine, Prednisone
PVB	Cisplatin, Vinblastine, Bleomycin
TBP	Thiotepa, Bleomycin, Prednisone

COMBINATION REGIMENS (Cont'd)

VAC	Vincristine, Actinomycin D, Cyclophosphamide
VAP	Vincristine, Adriamycin, Procarbazine
VATH	Vinblastine, Adriamycin, Thiotepa, Halotestin
VBAP	Vincristine, BCNU, Adriamycin, Prednisone
VBP	Vinblastine, Bleomycin, Cisplatin
VMP	Vincristine, Methotrexate, Prednisone (systemic consolidation therapy)

NOTES

Section 2

ANCILLARY DRUGS

Ancillary drugs are medications whose actions are not directed at the patient's malignancy per se but which enhance the effects of the cancer-directed therapy. For example, ancillary drugs may modulate the actions of specific chemotherapeutic agents by increasing their effectiveness in destroying tumor cells or by decreasing the potential for certain side effects. Ancillary drugs may be also used to control symptoms related to the patient's cancer or its treatment, or to manage other coexisting medical problems. **Ancillary drugs are NOT to be coded as cancer-directed therapy.**

Ancillary Drugs Administered with Chemotherapy

Ancillary drugs may be administered with chemotherapeutic agents to enhance their anti-neoplastic effects. The chemotherapeutic agent 5-fluorouracil (5-FU), an antimetabolite, works by inhibiting the enzyme *thymidylate synthesis* which is necessary for production of one of the components needed for DNA synthesis. Folinic acid (leucovorin) stabilizes the drug-enzyme complex and thus increases the cytotoxic effects of the 5-FU and is frequently administered with 5-FU for this purpose.

Ancillary drugs are also used for protection from side effects of chemotherapeutic agents. Folinic acid (leucovorin) is administered at a prescribed time after administration of methotrexate to decrease the toxic effects of the drug on rapidly-dividing cells such as bone marrow and the cells lining the gastrointestinal tract. Mercaptoethane sulfate (MESNA) is administered to patients receiving the alkylating agents ifosphamide and cyclophosphamide to prevent hemorrhagic cystitis. MESNA metabolizes in urine and binds to the toxic alkylating agent to prevent irritation of the bladder lining. Mannitol, a small sugar alcohol molecule, is administered intravenously in patients receiving cisplatin to increase urine flow (diuresis) and protect against kidney damage associated with chemotherapy.

Cancer cells may become resistant to chemotherapeutic agents through a variety of mechanisms. Multidrug resistance (MDR) occurs through genetic change and allows cancer cells to "pump out" chemotherapeutic agents before they can cause fatal damage to the cell. As part of the MDR phenomenon, cancer cells produce a substance called P-glycoprotein which binds to the chemotherapeutic agents within the cells and participates in the pump process. Calcium channel blocking agents, frequently used to treat cardiovascular disease, bind to P-glycoprotein and inhibit the MDR pump. The calcium channel blocking agent verapamil has been used with vinca alkaloids to reverse MDR in patients who have become resistant to vincristine or vinblastine, but this approach to modulating MDR is still under clinical investigation.

When large numbers of cells are destroyed by chemotherapy, materials from these cells must be cleared from the body. Uric acid, the chemical substance usually associated with gout, is produced as the cellular materials are dissolved by tissue enzymes and made ready for excretion by the kidneys. High plasma concentrations of uric acid may cause kidney damage (uric acid nephropathy) as the uric acid is filtered into the urine. This can be prevented in many patients by allopurinol, an oral medication that prevents the formation of uric acid by inhibiting the enzyme xanthine oxidase. Administration of allopurinol is particularly important in the treatment of hematologic malignancies (leukemia and lymphoma) because treatment of these tumors is most often associated with high levels of uric acid.

Radiosensitizers and Radioprotectants

In some instances, as with chemotherapy, the effects of radiotherapy may be modulated by agents which have no antitumor activity themselves. Radiosensitizing drugs augment the cytotoxicity of radiotherapy, and radioprotective agents diminish damage to normal, non-cancerous tissues. Many antineoplastic drugs, including the anthracyclines, 5-fluorouracil, and methotrexate, can enhance the cell killing effects of radiation; this is the basis for many combined-modality regimens. Other agents have been specifically synthesized as chemical modifiers of radiation effects and are under study in clinical trials.

The energy from therapeutic radiation ejects electrons from molecules in the target tissues. These electrons interact with other molecules in the cell to form free radicals which are unstable and highly reactive. DNA damage resulting from free radical formation contributes to cell injury and death. Thus any process which increases the DNA damage associated with free radical formation or inhibits damage repair results in radiosensitization.

Radiosensitizers are difficult to classify because they often have more than one mechanism of action. BUdR (Bromodeoxyuridine), an agent that is similar to the DNA precursor thymidine, is under study for brain tumors. Agents with electron affinity, such as metronidazole and misonidazole, are also in clinical investigation as radiosensitizers. Other agents in preclinical and clinical studies include SR 2508, Ro 03-8799, RSU 1069, and L-BSO.

Drugs or processes which interfere with free radical formation or facilitate repair of cellular damage result in radioprotection. WR-2721 is an interesting investigational new agent in this category because it appears to have activity not only as a radioprotectant but also in prevention of nephrotoxicity and neurotoxicity associated with cisplatin therapy.

Growth Factors

Suppression of blood cell production by the bone marrow and the resulting cytopenia is the side effect which most often limits the dose of chemotherapy that a patient can receive or necesitates a reduction in standard doses of chemotherapy. This is an important consideration because, for many cancers, tumor response to treatment depends on the amount of drug administered over a course of therapy (dose intensity).

Research studies of blood formation in bone marrow cultures have identified substances (or growth factors) which regulate blood cell growth and development. For example, GM-CSF is a colony stimulating factor (CSF) which promotes growth and development of clusters or "colonies" of blood cells which will become granulocytes and macrophages. G-CSF is a growth factor which acts at a later step in myeloid development and stimulates colonies which will produce predominantly granulocytes. Erythropoietin stimulates the production of red blood cells.

Recombinant DNA technology has allowed scientists to insert the genes responsible for growth factor production into bacteria, so that growth factors for clinical use can be produced by pharmaceutical companies from bacterial cultures. GM-CSF and G-CSF are now administered to patients who develop severe neutropenia as a side effect of chemotherapy, to facilitate bone marrow recovery and shorten the period of neutropenia. They also have been used to lessen bone marrow toxicity and allow administration of higher doses of chemotherapy.

Ancillary Drugs used in Symptom Control

Patients undergoing tumor-related therapy may develop uncomfortable symptoms related to their tumors (such as pain or cachexia), acute and subacute side effects from cancer treatment (such as nausea or mucositis), or more serious complications of therapy (such as systemic infections). Medications which are administered to control symptoms or side effects rather than as tumor-directed therapy are classified as ancillary drugs. Examples include analgesics for pain, antiemetics to prevent or control chemotherapy-induced nausea, clonidine for hot flashes associated with breast cancer therapy, and antibiotics for infection.

Some confusion arises when drugs that have antitumor effects in specific cancers are also used for symptom control. **Corticosteroids such as decadron are important therapeutic agents in the treatment of lymphoid leukemias, lymphomas, and multiple myeloma.** However, in the general cancer patient population, decadron is more often used for symptom control: to prevent nausea or drug reactions when chemotherapy is administered; to decrease the edema in tissue surrounding brain metastases; and, in some cases, to improve appetite in patients with cancer anorexia-cachexia syndrome.

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Acetaminophen		(reduces fever)	
Acetazolamide	ACZ	Diamox (carbonic anhydrase inhibitor) (diuretic)	
Acetylcysteine		5052	111180
Acyclovir		Zovirax	
Adicillin		Cephalosprin N (antibiotic)	
Albuterol		Proventil, Ventolin (bronchodilator)	
Alendronate Sodium		MK-217 (suppressant; bone resorption)	
Alizapride		(anti-emetic)	
Allopurinol*	ALLO	Allopur, Atisuril, Bloxanth, BW-56-158, Epidropal, Foligan, Gotax, HPP, Lopurin, Milurit, Uricemil, Uriprim, Urosin, Zyloprim, Zyloric	001390
Alprazolam		Xanax, U-31,889 (sedative)	
Amifostine		Ethiofos#, Ethyol, Gammaphos, WR-2721 (radioprotector) (prevents nephrotoxicity, neurotoxicity)	296961
Aminobenzoate Potassium		(analgesic)	
Aminosyn		(prevents acivicin-induced toxicity)	
Amiodarone		Cordarone, L-3428, SKF 33134-A (cardiac depressant)	
Batanopride HCl		BMY-25801-01 (Serotonin antagonist; anti-emetic)	
Benznidazole		(chemosensitizer)	
Benzquinamide		Quantril, P-2647 (anti-emetic)	064375
Beta Carotene		Solatene (ultraviolet screen)	
Borocaptate Sodium B 10		Borolife, NASH; BSH (radioactive agent)	
Bromodeoxyuridine	BUdR, BDU, 5-BDU, BrdUrd, 5-BUDR	5-Bromodeoxyuridine, 5-Bromodesoxy-uridine, Bromouracil deoxyriboside, 5-Bromouracil deoxyriboside, Broxuridine (radiosensitizer)	038297
Calcium Carbonate		Cal-Sup, Component of Calcitrel, Component of Titralac (antacid)	
Calcium Gluconate		Component of Calcet, (calcium replenisher)	
Calcitonin*		Calcimar, Cibacalcin (regulates calcium)	

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Chlornaphazine*		CB-1048, Chlornaftina, Chlornaphazin, Chlornaphthin, Chloronaphthina, Chloronaphthine, Cloronaftina, Erysan, Nafticlorina, Naphthylamine mustard, R-48	062209
Chlorpromazine*		Chlor-PZ#, Thorazine (anti-emetic; antipsychotic)	
Cimetidine		Tagamet	
Clonidine		Catapres-TTS (controls hot flashes in breast cancer therapy)	
Codeine		Analgesic (narcotic)	
Coenzyme Q		Reduces myoclonic seizures	
Combid spansule		(See Isopropamide Iodide and Prochlorperazine Maleate)	
CSF-GM		CSF-GM (H)/Yeast, Recombinant (Immunex), Recombinant Human GM-CSF Granulocyte-Colony Stimulating Factor	613795
CSF-GM		CSF-GM (Immunex) Granulocyte-Colony Stimulating Factor (Amgen)	614629
CSF-GM		(Schering) Plough CSF-Granulocyte-Macrophage	617589
CSF-GM		Granulocyte-Macrophage-Colony Stimulating Factor (Recombinant Human) (E.coli) CSF-GM E.coli (Hoechst)	622183
CSF-Macrophage		Macrophage-Colony-Stimulating Factor (M-CSF) Cetus	625377
CSF-Macrophage			635258
Danazol		Danocrine, Win 17,757 (antipituitary suppressant)	
Dexamethasone*∇	DECA, DM, DSM,	Aeroseb-Dex, Decaderm, Decadron Tablets, Decaspray, Component of Deronil, Component of Dexacidin, Dexasone, Dexone, Hexadrol Elixir, Hexadrol Tablets, Maxidex, Component of Maxitrol, Component of Tobradex (glucocorticoid)	345211
Deferoxamine		Prevents cardiac toxicity	527604
Defosfamide		Desmophosphamide	040627
Desmethyl-misonidazole	DES-ME	Demethylmisonidazole, Ro-5-9963, SR-1530, (radiosensitizer)	261036

∇ **If used in the treatment of the malignancies mentioned in the introduction on p. 37 (bold), code as hormonal therapy. For all other cancers, consider ancillary unless specifically stated to be hormonal therapy.**

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Diethyldithio-carbamate	DDC, DDTC, DEDC	Cuprol, Dithiocarb, Thiocarb	038583
Diltiazem HCl		Cardizem (vasodilator, calcium influx inhibitor)	
Dimepranol Acedoben		Component of Isoprinosine (immunomodulator)	
Diphenidol		Anti-emetic	
Diphenhydramine HCl		Benadryl, Component of Benylin, Component of Caladryl (antihistaminic)	
Dipyridamole		Persantine, Ra-8 (coronary vasodilator)	515776
Domperidone		R-33-812 (anti-emetic)	
Droperidol*		Inapsine, Component of Innovar, McN-JR-4749, R-4749	
Elliot's B solution			614386
EMLA			
Endorphin		Analgesic	
Erythropoietin		(See biological response modifiers)	
Etanidazole		Radinyl, SR 2508 (hypoxic cell radiosensitizer)	301467
Ethacrynic Acid		Edecrin, MK-595 (diuretic)	085791
Ethiodized Oil*		Ethiodol-131# (radio-opaque medium)	
Ethiofos		See Amifostine (radioprotector)	296961
Etidronate Disodium		Didronel (calcium regulator)	
Fansidar		Sulfadoxine/Pyrimethamine	
Fentanyl Citrate		Analgesic; narcotic	
Fluconazole		Diflucan (antifungal)	
Fluosol-DA		Radiation-sensitizing agent	
Flurbiprofen		Ansaid, BTS 18,322, U-27,182 (analgesic; anti-inflammatory)	
Furosemide*		Disal, Lasix, LB-502 (diuretic)	
G-CSF		r-met Hu G-CSF (Granulocyte Colony Stimulating Factor)	

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Ganciclovir	DHPG	Cytovene (therapy for immunosuppressed patients, bone marrow recipients)	
Glycine		Corilin, component of (irrigating solution)	
GM-CSF		Granulocyte macrophage colony stimulating factor	
Gold Au 198		Aurcoloid-198#, Aureotope# , Auroscan-198# (diagnostic aid, liver imaging; radioactive agent)	
Granisetron		BRL-43694 (serotonin antagonist; anti-emetic)	
Guanfacine HCl		Tenex	
Haloperidol		Haldol, McN-JR-1625, R-1625 (antipsychotic)	
Hematoporphyrin Derivative		Emits fluorescence in neoplastic cells	
Heroin HCl		Diacetylmorphine dihydrochloride, Diamorphine HCl, Heroin hydrochloride	302357
Hydrazine Sulfate		(anti-cachexia)	150014
Hydromorphone HCl		Dilaudid (analgesic; narcotic)	
Hydroxyzine HC1		Atarax, Component of Ataxaroid, Component of Cartrax, Component of Enarax, Component of Marax, Quiess, Vistaril, Component of Vistrax (tranquilizer)	
Hyperbaric Oxygen		Radiation-sensitizing agent	
Idoxuridine*	IDU, IDUR, IdUrd, IUdR, 5-IUDR	Allergan 211, Dendrid, Emanil, Herpesil, Herpidu, Herplex, Herplex Liquifilm, Idexur, Idoxuridin, Iducher, Idulea, Idu-Oculos, Iduridin, Iododeoxyuridine, Joddeoxyuridin, Kerecid, Ophthalmadine, SK&F 14287, Stoxil, Synmiol (radiosensitizer)	039661
Indomethacin*		Indocin (anti-inflammatory; lowers blood calcium) (analgesic)	
Inosine		Component of Isoprinosine	
Isoprinosine		Imunovir (Combination product: see Dimepranol Acedoben and Inosine)	
Isopropamide Iodide		(Used with Prochlorperazine Maleate as Combid spansule) (anticholinergic; anti-emetic)	
Itraconazole	ITZ	R-51,211, Sporonax (antifungal) (Rx of Candidiasis)	
Ketorolac Tromethamine		Toradol (anti-inflammatory; analgesic)	
L-BSO		L-Buthionine sulfoximine (radiosensitizer)	326231

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Leucovorin (calcium)*	CF, C.F. CL	Calcium folinate, Calcium leucovorin, Citrovorum factor, Folinic acid, Lederfoline, Leucosar, Wellcovorin	003590
Levonantradol (HCl)		CP-50,556-1 (analgesic)	331615
Lidocaine		Anestacon, Lidomantle-HC, component of of, Xylocaine (local anesthetic)	
Lithium Carbonate		C.P. 15,467-61, Eskalith, Lithane, Lithobid, Lithonate, Lithotabs, (antimanic)	016895
L-Leucovorin			
Lonidamine		Radiation-sensitizing agent	
Lorazepam		Ativan, Wy-4036 (anti-emetic)	
Loxoribine		Immunostimulant; vaccine adjuvant	
Magnesium Sulfate		Anti-convulsant; laxative; electrolyte replenisher	
Mannitol		Diuretic	
Mannomustine	BCM	Degranol, Mannit-Lost, Mannit-Mustard, Mannitol Mustard	009698
MDL-72222		Serotonin antagonist; anti-emetic	
MDL-73147EF		Serotonin antagonist; anti-emetic	
Meperidine HCl		Demerol, Demerol HCl, Mepadin#, Component of Mepergan (analgesic; narcotic)	
Mesna*		D 7093, Mesnex (uromitexan), Mesnum, Mistabron, Mitexan, Mucofluid, Sodium 2-mercaptoethanesulfonate (prevents bladder toxicity)	113891
Methadone HCl		Adanon HCl#, Dolophine HCl, Component of Mespergan, Methadose (analgesic; narcotic)	
Methoxsalen		8-MOP, Oxsoralen (photosensitizer)	
Methylphenidate HCl		Ritalin	
Metoclopramide (HCl)*	MCP	AHR-3070-C, Octamide PFS, Reglan (anti-emetic)	
Metronidazole		Radiosensitizer (See also Drugs Used in Rx of AIDS complications)	

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Metyrosine		Anti-hypertensive; therapy for malignant pheochromocytoma	
Midazolam HCl		Ro 21-3981/003, Versed (anesthetic; CNS depressant)	
Misonidazole	MNI	Ro-7-0582, SR-1354, SRI-1354 (radiosensitizer)	261037
Molybdenum		Metabolic therapy	
Morphine Sulfate		Astramorph, Duramorph, MS Contine, MSIR (analgesic; narcotic)	
Nabilone		Cesamet, Cpd 109514 (tranquilizer)	
Naloxone HCl		Antagonist to narcotics	
Naltrexone		EN-1639A, Trexan (antagonist to narcotics)	
Naproxen		Naprosyn, RS-3540 (anti-inflammatory; analgesic; antipyretic)	
Niacin		Niac, Nicobid, Nicolar (therapy for patients on parenteral nutrition)	
Nifedipine		Calcium channel blocking agent	
Nortriptyline HCl		Aventyl HCl, Pamelor, 38489 (antidepressant)	
Ondansetron HCl		GRF 38032F, Ondanserin, Zofran (serotonin antagonist; anti-emetic, antischizophrenic, anxiolytic)	
Pamidronate Disodium		Aredia (suppressant; bone resorption) (Hypocalcemia)	
Papaverine HCl		Cerespann, Component of Copavin, Pavabid (smooth muscle relaxant)	
Pentoxifylline		BL 191, Trental (vasodilator) (radiation-sensitizing agent)	
Perphenazine		Component of Estrafon, Component of Triavil, Trilafon	
Pimonidazole		Ro 03-8799 (radiosensitizer)	
Piperazine		Antiren, Dispermine, Eraverm, Hexahydropyrazine, Lumbrical, Piperazidine, Piperazin, Pipersol, Pyrazine Hexahydride, UN 2579, UN 2685, Uvilon, Vermex, Component of Wazine-34, Wurmirazin (anthelmintic)	000474
Piroxicam		CP-16,171, Feldene (anti-inflammatory)	
Polyethylene Glycol	PEG	Carbowax Sentry, Colyte, component of, Pluracol E400, E600, E1450	
Probenecid		Uricosuric; increases excretion of uric acid in respiratory acidosis	

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Prochlorperazine*		Compazine, Component of Eskatrol# (anti-emetic)	
Prochlorperazine Maleate		Used with Isopropamide Iodide as Combid spansule (anticholinergic; anti-emetic)	
Promazine HCl*		Sparine (antipsychotic)	
Promethazine HCl*		Anergan 25, Anergan 50, Component of Mepergan, Phenergan, Component of Phenergan-D, Component of Phenergan VC, Remsed (anti-emetic)	
Pyrazinamide	PZA		
Pyridoxine HCl		Beesix, Hexa-Betalin, Vitamin B6 (reduces neurotoxicity)	
Pyrimethamine		BW 50-63, Chloridin, Chloridine, Darapram, Daraprim, Daraprime, Diaminopyritamin, Erbaprelina, Component of Fansidar, Malocide, Pirimecidan, Pirimetamina, Tindurin	003061
Quinacrine (HCl)	Atab, QUIN	Acrichin, Acrinamine, Acriquine, Akrichin, Antimalarina, Atabrine HCl, Haffkinine, Italchine, Mepacrine, Quinactine	014229
Quinidine		Chemosensitizing agent	
R-Verapamil HCl		Calcium channel blocking agent	632821
Rhenium-186	HEDP	Hydroxyethylidene diphosphonate (palliative, skeletal metastases)	
Riboflavin		Cancer preventative	
Ro-03-8799		Pimonidazole (radiosensitizer)	
RSU 1069		Radiosensitizer	
Serotonin		GR 38032 F (antagonist)	
Sodium Chloride		Ayr (chemoprotective agent reduces nephrotoxicity)	
Sodium Fluoride		Floridine, Fluorol, Pergantene, Xaridium, Zymafluor	077385
Sodium Iodide		I 131 Idotope	
Sodium Phosphate P 32		Radioactive agent, diagnostic aid	
Sodium Thiosulfate		Sulfactol#, Component of Komed, Component of Tinver (reduces nephrotoxicity)	045624
Sparfloxacin			
Spiramycin		Leucomycin	055926
SR 2508	SN	See Etanidazole (radiosensitizer)	301467

ANCILLARY DRUGS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Sucralfate		Carafate (anti-ulcerative)	
Sulfadiazine		Sulfonamide Duplex, component of#	
Sulfamethoxazole		Azo Gantanol, component of, Bactrim, component of, Cotrim, component of, Gantanol, Septra, component of, Sulfatrim, component of	
Sulindac		Clinoril (anti-inflammatory)	
Tetrahydro-cannabinol	THC	Cannabinol, Delta-9-THC, Dronabinol, Marinol, SP-104 (anti-emetic)	134454
Theophylline		Bronchodilator	
Trifluprομazine HCl*		Vesprin (antipsychotic)	
Trimethobenzamide HCl		Tigan (anti-emetic)	
Trimethoprim	TMP	Bactrim, component of, Cotrim, component of, Proloprim, Septra, component of, Sulfatrim, component of, Trimpex	106568
Tropisetron		ICS-205930 (Serotonin antagonist; anti-emetic)	
Urokinase		Plasminogen activator; thromboembolytic therapy	
Verapamil (HCl)*		Calan, Isoptin, Isoptin hydrochloride, Izoptin, Verapamil (Isoptrin), Verelan (chemosensitizer) (calcium channel blocker)	256325
Vitamin E		Anti-fibrosis therapy	
Warfarin Sodium*		Coumadin, Panwarfin (anticoagulant)	059813
WR 2026			
WR 2721		See Amifostine	296961

NOTES

Section 3

DIFFERENTIATION-INDUCING AGENTS

A new approach to cancer therapy seeks to prevent the development of a cancer cell or to reverse its malignant potential by inducing its differentiation.

Most normal cells are differentiated, that is, they have progressed through stages of normal development to have specific characteristics and function. During the process of differentiation, normal cells tend to lose the ability to proliferate. In most tissues, a few progenitor cells (stem cells) remain undifferentiated and retain the ability to produce new cells, to replace the normal loss of mature cells. Most cancers probably develop from these less mature progenitor cells.

A precursor cell that undergoes malignant transformation usually loses its ability to differentiate in an efficient and orderly manner, while it retains the ability to proliferate. However, many tumors have enough differentiation to allow pathologists to determine the tissue of origin or "primary site" of the tumor. In some tissues there is an orderly progression from benign tissue to noninvasive but premalignant lesions to frank malignancy. For example, in the uterine cervix, normal tissue may progress through stages of hyperplasia, metaplasia, anaplasia, carcinoma-in situ, to invasive carcinoma.

The objective of using differentiation-inducing agents is to prevent the onset of frank malignancy and/or to convert a premalignant tumor into a more differentiated growth without invasive and metastatic properties. In contrast to conventional cytotoxic chemotherapeutic agents, which cause the death of tumor cells, differentiation-inducing agents may control the expression of specific genes and thereby prevent the progression of a premalignant cell to a malignant state.

Current experimental studies suggest that non-cytotoxic concentrations of a number of low molecular weight chemicals can induce differentiation of several tumor cell lines in cultures, and several of these agents are under clinical study. These agents include 1,25-dihydroxyvitamin D, dimethyl sulfoxide, hexamethylene bis-acetamide, 4-hydroxyphenyl retinamide and 13-cis retinoic acid.

Some drugs may have different effects at different doses. For example, Ara-C is used as cytotoxic chemotherapy in high doses to treat acute myeloblastic leukemia. It is also used in much lower doses as a differentiating agent in pre-leukemia (myelodysplastic syndromes), to stimulate immature cells to progress to more mature forms.

Outside clinical trials for cancer treatment, differentiating agents are most often used in patients as chemoprevention of a new cancer. For example, a patient who has had an oral cancer removed may take 13 cis-retinoic acid to prevent a second (new) oral tumor. Thus, differentiating agents should not be coded as cancer-directed therapy unless the chart specifically states that it is.

DIFFERENTIATION-INDUCING AGENTS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+MSC No.
Do not code as cancer-directed therapy. See Introduction.			
Acitretin		Soriatane	
Dimethyl Sulfoxide		See Biological Response Modifiers	000763
1,25-Dihydroxy-vitamin D3	Vit D3		
Etretinate		Tegison	
HMBA		Hexamethylene bisacetamide, Hexamethylene diacetamide	095580
4-Hydroxyphenyl retinamide	4-HPR		
Mycophenolic acid		Melbex#, 68618	129185
Phenyl Acetate			
Retinoic acid	Vit A	Accutane, Isotretinoin*, Neovitamin A acid, Ro 4-3780, 13-cis-Retinoic acid, 13-cis-Vitamin A acid	329481
Retinyl Acetate	RA		
Sodium Butyrate			
Tretinoin*	Vit A	Aberel, Airol, All-trans-retinoic acid, Dermairol, Eudyna, Retin-A, Retinoic acid, Vitamin A acid	122758

AGENTS WITH BOTH CYTOTOXIC AND DIFFERENTIATING PROPERTIES

Code as chemotherapy.

Cytarabine	Ara-C	Cytosar-U, Tarabine, U-19920, (under investigation for Rx of Progressive Multifocal Leukoencephalopathy (PML))	
Azacitidine	5-AC, 5-AZA, 5-AZAC, AZC, 5-AZCR	Antibiotic U-18,496, Azacytidine, 5-Azacytidine, Ladakamycin, Mylosar (antimetabolite)	102816
N-Methylformamide	NMF	Methylformamide, Monomethylformamide	003051

NOTES

Section 4

BIOLOGIC THERAPY OF CANCER

Biologic therapy or **immunotherapy** is defined as treatment that produces its anticancer effect by enhancing the patient's natural defense mechanisms against cancer. This is accomplished by administering agents that modulate the patient's immune response to his/her tumor, by providing additional natural immune molecules made through new technologies, or by transferring immune cells stimulated to act against the patient's cancer. The drugs, chemicals, or biologic agents used in biologic therapy are often referred to as **biological response modifiers**.

Biologic therapy is a new and rapidly developing area of oncology. Research in this area has been stimulated by increased understanding of the activity of the human immune system and by advances in biotechnology that have made possible the production of antibodies and other immune molecules by recombinant DNA methods.

The Human Immune System

In contrast to most other organ systems, the cells of the immune system are not in constant contact with each other. Lymphocytes, monocytes, macrophages, and other immune cells move freely throughout the lymphatic and circulatory systems. Their specific functions and complex interactions give rise to a highly organized system of host defense against "non-self" substances, organisms, or cells.

Antibodies are proteins that are produced by the body in response to a foreign substance (**antigen**). These protein complexes consist of units (**immunoglobins**) which are composed of pairs of heavy (longer) and light (shorter) polypeptide chains. Antibodies have distinct binding sites which react with the specific antigen that stimulated their production. This phenomenon of **humoral immunity** explains why one rarely has childhood diseases such as measles or mumps twice.

A recent advance in immunology has been the recognition that certain groups of lymphoid cells can secrete a second type of protein molecule that is structurally different from antibodies. These **cytokines** are produced in small amounts and are usually not detectable in plasma. They function as hormones, acting on a broad spectrum of immune cells and on cells outside the immune system. Identification of specific cytokines and exploration of their activities have led to new and exciting approaches to biotherapy of cancer.

Immune System Cells

Lymphocytes, the central cells in immune function, are classified according to development and function as **B cells**, **T cells**, and **null cells**. In addition, detailed studies of leukocyte cell surface antigens have led to identification of groups of antigens called clusters of differentiation (CDs) which are also used to classify lymphocyte subpopulations.

In humans, B cells develop in the bone marrow. As they mature, they develop immunoglobins on their surface which function as antigen receptors; they also develop cell surface receptors for **lymphokines** (cytokines produced by lymphocytes). B cells require both the presence of antigen and stimulation by lymphokines to produce an antibody response.

T cells mature and differentiate in the thymus before dispersing to other lymphoid tissue. In contrast to B cells which function in humoral immunity, T cells have prominent roles in **cellular immunity**. T cells also recognize antigen in a manner quite different from that of B cells. In general, T cells cannot respond to an antigen without the assistance of other cells. Antigen must be "processed" by other cells and presented to the T cell as a combination of antigen components with major histocompatibility complex (MHC) molecules, while B cells can recognize and respond to unprocessed antigen.

Traditionally, T cells have been classified by function as helper, suppressor, or cytotoxic T cells. Currently, two major subsets of T cells are identified by the class of MHC molecules required for antigen recognition. T cells which require Class I MHC molecules (i.e., HLA-A, B, or C) express the cluster of differentiation CD8 on their cell surfaces, while T cells which require Class II MHC molecules (i.e., DP, DQ, and DR) express the cluster of differentiation CD4. While cells with helper and cytotoxic functions can be identified within each subset, CD4+ T cells are more likely to express helper function, and CD8+ cells are more frequently cytotoxic or are more often capable of suppressing the immune response of other lymphoid populations.

Null cells are lymphoid cells which express neither T cell nor B cell surface markers. Subgroups derived from null cells include **natural killer (NK) cells, lymphokine-activated killer (LAK) cells,** and cells involved in antibody-dependent cellular cytotoxicity.

Reticuloendothelial cells, especially circulating **monocytes** and tissue **macrophages**, are also important components of the immune system. Monocytes are produced and mature in the bone marrow, enter the circulation, and then exit into tissue where they may die or mature further to become tissue macrophages. Macrophages are highly phagocytic cells which engulf, process, and present antigen components to T lymphocytes. They also produce **monokines** (cytokines) which facilitate T-cell activation and interaction with B cells to induce antibody formation.

Immune-mediated Cell Destruction

The immune system can cause the destruction of target cells through a variety of mechanisms. Certain subtypes of antibodies (IgG and IgM immunoglobins), attached to cell surface antigens, can activate **complement**, a system of functionally linked proteins that interact to damage the target cell membrane. Antibodies attached to cell surface antigens can also act as **opsonins**, making the target cells more susceptible to phagocytosis by macrophages.

Target cell lysis can occur by direct actions of immune cells. **Cytotoxic T lymphocytes** (CTLs) bind to surface antigens on target cells and release cytotoxic substances by the T cell. CTLs are not damaged during this process; they detach from the target cell and recycle to attack other target cells. Antibodies to surface antigens on target cells or lectins can serve as a crosslink between target cell and cytolytic immune cells in antibody (or lectin)-dependent cellular cytotoxicity. NK cells have the ability to lyse cells in cultured cell lines without prior immune sensitization to the cells, but they appear to have little effect on fresh tumor cells. LAK cells develop the ability to kill tumor cells after exposure to the cytokine interleukin-2 (IL-2).

Many cytokines can mediate cell destruction, either by direct toxicity toward target cells or by initiating an inflammatory reaction in target tissue.

Tumor Antigens

When a cell becomes malignant, it undergoes biochemical changes that may result in the production of new cell surface proteins capable of distinguishing it from a normal cell. Such tumor antigens may be seen as foreign by the host immune system and may result in a specific immunologic response to the tumor cells. In animal models, tumor antigens may be highly specific for an individual tumor cell line. However, most tumor antigens studied in naturally-occurring tumors are shared by different tumors and may even be expressed to a lesser extent by normal cells; these are termed **tumor-associated antigens**.

Tumor infiltrating lymphocytes (TILs) have been isolated from the inflammatory infiltrates of a variety of human cancers. TILs with specific cytolytic function have been isolated from human melanoma and occasionally from renal cell cancer; nonlytic TILs with specific recognition of tumor antigens have been identified in patients with melanoma and breast cancer. TILs can be activated and expanded in culture with IL-2.

Immunotherapy

Agents and substances used in biologic therapy, or immunotherapy, may be classified according to the way in which they modify the host defense mechanism.

Active Immunotherapy

Active immunotherapy refers to immunization of the cancer patient with materials designed to elicit an immune reaction against the patient's tumor. Early attempts at immunotherapy focused on nonspecific stimulation of the immune system by bacterial products, in hopes that general immune stimulation would lead to an increased host immune response to its established tumor. This approach developed from observations of tumor regression following severe bacterial infections or exposure to bacterial toxins. Agents used for nonspecific immune stimulation include BCG, MER, *C. parvum*, and levamisole.

Prospective randomized clinical trials have failed to support a role for nonspecific immunotherapy in the cancer treatment, with a few notable exceptions. The addition of levamisole to adjuvant therapy with 5-fluorouracil has improved survival in patients with Stages B2 and C colon cancer. Intralesional immunotherapy of cutaneous metastases from malignant melanoma with BCG has resulted in good local control, and BCG has been used successfully as instillation therapy for the treatment of superficial bladder cancers.

Other approaches to active nonspecific immunotherapy involve administration of cytokines such as interferon or IL-2 to enhance host immune response. **Interferons** (INFs) belong to a family of proteins produced by cells in response to viral infection. Three major classes of interferons have been identified: INF-alpha, produced by leukocytes; INF-beta, produced by fibroblasts and epithelial cells; and INF-gamma, produced by activated lymphocytes. In addition to antiviral and immunomodulatory effects, biologic properties of interferons include antiproliferative activity, regulation of differentiation, interaction with other cytokines, and enhancement of tumor-associated antigens.

Recent progress in recombinant DNA technology has made large quantities of recombinant interferons (rINFs) available for clinical studies. Interferons have antitumor activity against a variety

of solid tumors and hematologic malignancies, including hairy cell leukemia, chronic myelogenous leukemia (CML) and other myeloproliferative disorders, cutaneous T-cell lymphoma, and Kaposi's sarcoma.

Interleukin 2 (IL-2), a cytokine produced by activated T lymphocytes, has several actions of interest in immunotherapy. IL-2 stimulates the growth and proliferation of lymphoid cells and causes the release of a variety of other cytokines; it also enhances cytolytic activity of adoptively transferred cells (see below). IL-2 has no direct activity against cancer cells.

IL-2 has been used alone and in conjunction with adoptive transfer of lymphoid cells. IL-2 as a single agent has produced complete and partial responses in patients with advanced renal cell cancer and melanoma. rIL-2 was the first biologic response modifier to receive approval by the U.S. Food and Drug Administration for the treatment of advanced cancer that acted only through immune mechanisms.

Active specific immunotherapy involves immunization to boost the cancer patient's immune response specifically against his/her own tumor. This approach relies on the presence of tumor-associated antigens on the surface of the malignant cells and on the ability of these antigens to produce a host immune response. Development of tumor vaccines is an area of concentrated research effort at the present time.

Passive Immunotherapy

In cancer treatment, passive immunotherapy refers to the administration of specific antibodies or activated immune cells directed toward a patient's tumor. This is an area of intense research effort, and the therapeutic approaches described below represent investigational procedures at cancer research centers rather than standard cancer care.

The recognition of specific tumor antigens and the development of **monoclonal antibodies** (MOABs) with relatively unique specificity for these antigens have fostered new approaches to cancer diagnosis and therapy. As with antibody-mediated cytotoxicity described above, unmodified MOABs can kill tumor cells through activation of complement or through antibody-dependent cellular cytotoxicity. Tumor responses to unmodified MOABs have been observed in the treatment of B-cell lymphoma and in T-cell leukemia or lymphoma.

Monoclonal antibodies can also be conjugated with nonimmune cytotoxic substances to enhance antitumor effects. Examples of these conjugates include chemotherapeutic drugs (e.g., adriamycin), toxins (e.g., ricin), and radionuclides (e.g., ^{131}I, ^{111}In, ^{90}Y).

Adoptive immunotherapy refers to the administration of cells with antitumor activity to the cancer patient. This approach uses either LAK cells or TILs in combination with IL-2 to confer enhanced cell-mediated tumor lysis. In a variety of tumors, the response rate to LAK cells with IL-2 has been relatively low: best objective response rates of 15-30 percent have been observed for melanoma and renal cell cancer. Pilot studies of therapy with TILS and IL-2 in patients with advanced cancer are currently in progress.

Clinical Research in Cancer Immunology

The interaction between the immune response of a tumor-bearing individual and his/her cancer is undergoing intensive investigation. The major goals of immunological research are earlier diagnosis and effective immunization as a mode of cancer therapy. Although much has been learned about the etiology and biology of many tumors, much is yet unknown about tumor immunology. Dramatic expansions in understanding the role of the immune system in the etiology, prevention, and control of cancer offer hope that these goals will eventually be achieved.

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BIOLOGICAL RESPONSE MODIFIERS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
ADA Transduced T-cell		Autologous Lymphocytes	635386 373364
Allogeneic cells		Allogeneic therapy, Allogeneic bone marrow transplantation, Bone marrow therapy, Killed tumor cells	
Anticea, I-131		Antiferritin antibody	
Anti-Thymocyte Globulin			
Asparaginase (Escherichia coli)	L-ASP, ASP, ASPA, L-ASE	Asnase, L-Asparaginase, L-Asparagine amidohydrolase, Colaspase, Crasnitin#, EC 3.1.5.1, Elspar, Leunase (enzyme)	109229
Asparaginase (Erwinia carotovora)	L-ASP	L-Asparaginase, Porton asparaginase (enzyme)	106977
Asparaginase-PEG (K-H)			644954
Asparaginase-PEG		(Merck)	624239
Autologous		Autol Tumor-Trnsdcd/Gene for IL-2 (GTI),	373364
		Autol Tumor-Trnsdcd/Gene for TNF (Cetus),	
		Autol Tumor-Trnsdcd/Gene for TNF (GTI),	
		Autol Tumor-Trnsdcd/Gene for TNF-COMPA (Cetus), Autologous Tumor Cell (BCG) + IL-2 (Bionetics),	624355
		Autologous Tumor Cell (BCG + IL-2 (Cetus),	373364
		Autologous Tumor Cell Vaccine + IL-2 (Cetus)	
		Autologous Tumor Cell Vaccine + BCG (Bionetics)	624335
Azimexon	AMX	2-aziridinecarboxamide compound (synthetic chemical, immunomodulator)	
BACI		Bovine anti-Cryptosporidium Immunoglobulin	
BCG		Bacillus Calmette-Guerin (Bacterial and Fungi, Mycobacteria biological) (Mycobacterium bovis) (immunomodulator)	
		• Connaught	614389
BCG (Cont'd)		• Pasteur	B116328
		• Tice	614388
		• TheraCys	
BCG	MER	Methanol extracted residual of BCG (Bacteria & Fungi Mycobacterial biological)	143769
Bestatin	BST	(Bacteria & Fungi Streptomyces biological) (immunomodulator)	

BIOLOGICAL RESPONSE MODIFIERS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Beta-Carotene		Solatene (ultraviolet screen)	
Biostim		RU 41740	
Bromocryptine		Bromoergocryptine	
C-parvum	C.p., CPAR	Coparvax (R), (Merrieux) Corynebacterium parvum, H37Ra (immunomodulator)	197213
		Corynebacterium parvum, Wellcome CN6134 (BW) (Bacteria & Fungi biological)	220537
		Corynebacterium granulosum (Bacteria & Fungi biological)	
CGP 19835A	MTP-PE		
Copovithane	CPV		
Cyclosporine		Cyclosporin#, 27-400	
Danazol		Chronogyn#, Danocrine	
Dehydroemetine			
Detox			
Dimethyl sulfoxide	DMSO	Demasorb#, Demavet, Demeso, Demsodrox, Dermasorb, Dimexide, DMS-70, DMS-90, Dolicur, Dolisur, Domoso, Dromisol, Durasorb, Gamasol 90, Hyadur, Infiltrin Methyl sulfoxide, Somipront, SQ 9453, Sulfinylbismethane, Syntexan	000763
Dimethylbusulfan			
Dinitrochlorobenzene			
Dinitrofluoro-benzene	DNFB		
Erythropoietin	EPO	Epogen, Epoietin Alfa, Eprox, rHu-EPO, Procrit (stimulates RBC production)	628281
Ethylchlorformate			
Filgrastim		Neupogen, r-met Hu G-CSF	
Freund's adjuvant	FCA	(Bacteria & Fungi, Mycobacteria biological)	
Gallium Nitrate	GAN	Gallium trinitrate, Ganite	015200
Ganglioside	GM2		
HLTV antibody			
4'-Hydroperoxycyclophosphamide			

BIOLOGICAL RESPONSE MODIFIERS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
I 131	131 I	Antiferritin antibody (see Anticea)	
Imexon		1,3-Diazabicyclo (3.1.0.) Hex-3-en-2-one, 4-amino (synthetic chemical)	
Immune RNA		(Mammalian biological product) (immunomodulator)	
Imuvert			
Interferon and Interferon inducers	IF, IFN	Human fibroblast interferon Human leukocyte interferon (Meloy) IFN: Leukocyte (Meloy)	335044
		Human leukocyte interferon (W-L)	340855
		Human leukocyte interferon, Beta (Mochida)	605606
Interferon Alfa-n1		Human lymphoblastoid interferon (BW) Wellferon	339140
Interferon Alfa-n3		Alferon N Injection, Leukocyte Interferon#, Alferon Rec Gamma (Biogen)	
Interferon		Immune interferon (Meloy), IFN: Immune	354655
		IFN: Rec Gamma (Schering)	609473
Interferon Alfa-2a		Recombinant Leukocyte A interferon, Roferon, Roferon-A, Ro 22-8181 (HLR)	367982
Interferon Alfa-2b		Recombinant Alpha 2 interferon, Betaseron, Recombinant interferon Gamma, (B), Gamma Interferon, Intron A (Recombinant analogue, Bacterial) IFN: Rec Gamma (Biogen)	
Interferon Gamma-1b		Recombinant interferon Gamma (G), Immune Actimmune (Genentech)	600662
Interleukin-1		IL-1 Beta (Syntex), Interleukin-1 Beta IL-1 Beta (Syntex) + Il-2 (Cetus)	628282
		Il-1 alpha, Interleukin-1 alpha (Dainippon)	621381
		Il-1 alpha (Immunex)	640032
Interleukin-2	IL-2, TCGF	Human Jurkat Tumor Derived, (Dupont) Il-2 Jurkat Derived	364831
		IL-2 Recombinant Interleukin-2	373364
		IL-2: Rec (Cetus), Aldesleukin, Proleukin	
		IL-2: Rec (Shionogi), S6820	
		IL-2: Rec (Cetus) + TIL	
		IL-2 (CT)/MDELAK	
Interleukin-2		IL-2 /Adherent LAK (CT)	

BIOLOGICAL RESPONSE MODIFIERS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
		Aut Tum Vac/IL-2/BCG	373364
		Aut Tum Vac/BCG/Il-2	
		Aut Tum Vac/Il-2 /BCG, Tice BCG Vaccine, frozen	624335
		IL-2 (CT)/TIL (BiorExp)	
		IL-2: Rec.(HLR)	600664
		IL-2/TIL (HLR)	
		IL-2/AutoEduLymph (HLR)	
		IL-2 Recombinant	
		IL-2 (HR)	
		IL-2 (HR)/OKT 3-LAK	600664
		IL-2 Polyethylene Glycol (Peg IL-2)	625376
		IL:-2 (HR)/OKT 3-LAK	600664 618843
		IL-2 Natural (Collaborative)	600663
		IL-2 + IL-4 (Cetus & Sterling)	373364
		IL-2 + IL-4 (Cetus & Sterling)	620211
		IL-2 + IL-4 HLR/STRLNG	600664
Interleukin-2 liposome			
Interleukin-3		IL-3 + GM-CSF	643496
		IL-3 + GM-CSF (Sandoz)	641115
Interleukin-4		IL-4, Interleukin-4 (Immunex) Eastman Kodak	620611 620211
		IL-4 (K)/IL-2 (CT)	620211 373364
		IL-4 (K)/IL-2 (HR)	620211 600664
Interleukin-6		(Sandoz)	643497
Ipomeanol		4-Ipomeanol	349438
IVIG		Gammaguard (Immune globulin)	
LAK cells		Lymphokine activated killer cells	
Lentinan		(Bacteria & Fungi Lintinus Edodes biological) (immunomodulator)	
Levamisole HCl*	LEV	Citarin L, Decaris, Ergamisol, Ketrax, Levomysol HCL, R-12,564, Ripercol L, L-Tetramisole HCl, Tetramizole, Tramisol, Tramisole (Synthetic chemical, immunomodulator)	177023
Meg-CSF			

BIOLOGICAL RESPONSE MODIFIERS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Methionyl Interferon-Consensus			
Monoclonal Antibody	MoAB	New monoclonal antibodies are rapidly being developed. Therefore, they will not be listed individually. They should be coded as biological response modifiers. For an up-to-date list, please see the new edition of Biologic Therapy of Cancer that will be available soon (Item 6, References).	
MVE-2		Maleic anhydride divinyl ether copolymer (immunomodulator)[1]	332586
N2-TIL/ADA Gene		Adenosine Deaminase Transduced Autologous T-lymphocytes	635386
N2 Transduced TIL		N2 Retroviral Vector with Neo(R) Gene Insert	622283
Nocardia rubra	N-CWS	Cell wall skeleton (Bacteria & Fungi biological) (immunomodulator)	
Octreotide Acetate		Sandostatin (Reduces secretory diarrhea)	
OK-432		Beta hemolytic Streptococci (Bacteria & Fungi Streptococcus biological)	
Ovine Sialomucin		(immunomodulator)	
Pegaspargase		(Enzon)	
PEG-IL-2		(CT)	625376
Pentostatin	DCF, 2'-DCF	CI 825, CL-67310465, Co-Vidarabine, Deoxycoformycin, 2'-Deoxycoformycin, Nipent	218321
Poly AU		Polyadenylic-polyuridylic acid, Poly A-poly U	
5'-Inosinic acid polymers	Poly I:C	Poly(rI).poly(rC), Poly I:C, Polyribocytidylic-polyriboinosinic acid	120949
Poly I:Poly C with Poly-L-lysine stabilizer	Poly IC/LC	Polyinosinic-Polycytidylic acid stabilized with Poly-L-lysine and carboxymethylcellulose (Interferons and Interferon inducers)	301463
Poly I: Poly C12U		Ampligen	
Protein A Staphylococcus Aureus		Cowan I	
Pseudomonas aeruginosa		Heptavalent lipopolysaccharide (Bacterial & Fungi biological)	
PSK		(Bacteria & Fungi biological)	
Pyran copolymer		Divema, Pyran, Pyran XA 124-177, XA 146-85-2	046015

[1]Drugs previously known as immunotherapy drugs are now being considered biological response modifiers.

BIOLOGICAL RESPONSE MODIFIERS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Recombinant Soluble CD4		rCD4	
Recombinant Soluble T4		sT4	
Recombinant Tumor Necrosis Factor		rTNF (produced by recombination)	
Sargramostim		Leukine, Prokine (Recomb. granulocyte-macrophage colony-stimulating factor) (reduces duration and impact of neutropenia)	
Thymosin	Alpha 1		337793
Thymosin	Fx5	Human thymosin-fraction 5	350391
		Human thymosin-fraction Alpha 1 (Mammalian biological product) (Thymosins)	337793
Tilorone		(Synthetic Chemical) (Immunomodulator and Interferon inducer	
TIL/TNF		Retroviral vector carrying gene coding for tumor necrosis factor (PA 317/LTNFSN) (Cetus)	636228
		TIL transduced with NEOR Gene IL-2 (NHLBI)	622283
		TIL transduced with NEOR Gene IL-2/IL (Cetus/Sterling/GTI)	622283
		TIL transduced with NEOR Gene IL-2/IL-4 (Cetus/Sterling)	373364
		TIL transduced/Gene coding for TNF (Cetus)	636228
		TIL transduced/Gene coding for TNF	373364
		Tumor Primed Anti-CD3 activated lymphocytes	618843
TNF Transd TIL (GTI)		Tumor infiltrating lymphocytes transduced with the tumor necrosis factor gene (Retrovirus vector TNF-NeoR-GTI)	637656 373364
Tumor necrosis factor	TNF	(Cetus) (Genentech) (Knoll)	606515 604175 635257
TP OKT 3 Lymphoctyes			618843
Tumor primed Anti-CD3		Activated lymphocytes	618843
Vibrio cholera neuraminidase	VCN	Malignant cell antigens, Mammalian biological product	

NOTES

Section 5

HORMONES AND AGENTS ACTING VIA HORMONAL MECHANISMS

Hormones are substances produced by the body which help regulate body mechanisms such as growth, metabolism, and reproduction. Used in the treatment of cancer, administration of hormones, withdrawal of hormones, or interference with hormone function may alter the growth of hormone-responsive malignant neoplasms. Cancer therapy which achieves its anti-tumor effect through changes in hormonal balance is often called endocrine therapy. This includes the administration of hormones, agents acting via hormonal mechanisms, antihormones, steroids, and surgery or radiotherapy directed at hormone-producing tissue.

Cancers in which endocrine therapy causes tumor regression are often referred to as hormone-responsive. In general, hormone-responsive cancers derive from tissue which require hormones for normal development (e.g., breast and prostate cancers). However, some cases of other cancers, particularly melanoma and hypernephroma, may also respond to endocrine therapy.

In recent years, laboratory methods have been developed to identify the presence of specific hormone receptors on the surface of normal and malignant cells. The presence of hormone receptors (particularly of estrogen and progesterone receptors in breast cancer) may predict the response of the patient's tumor to endocrine therapy. A positive response to endocrine therapy observed in some cases of receptor-negative tumors suggests that hormonal agents may exert their effects through other pathways in addition to direct action on hormone receptors of cancer cells.

Hormones

Synthetic hormones may be administered in **pharmacologic** doses which achieve hormone levels far above the natural (**physiologic**) hormone levels, to alter hormone balance in the patient and modify the growth of susceptible cancers. These compounds are usually classified as estrogens, progestins, androgens, and corticosteroids.

Administration of estrogen, usually the oral estrogen diethylstilbestrol, has been a standard therapy for advanced prostate cancer since the 1940's. In men, pharmacologic doses of estrogen suppress luteinizing hormone (LH) release by the pituitary gland and result in decreased testosterone production (see below). This "androgen withdrawal" effect produces a clinical response in most patients with previously untreated disease that is comparable to the therapeutic effect associated with orchiectomy.

Hormone manipulation can provide effective control of breast cancer for many women with slow-growing metastatic disease, particularly in soft tissue or skeleton. Hormone receptor levels in breast cancer tissue are useful predictors of response in breast cancer patients: up to 75% of women with tumors positive for both estrogen receptors and progesterone receptors will respond to endocrine therapy.

Common approaches to hormone therapy for breast cancer comprise the oral administration of pharmacologic doses of an estrogen, progestin, or androgen as a single agent. Patients who have a good initial response to additive hormone therapy but develop disease progression on treatment may experience a second response when the initial agent is discontinued. Breast cancer patients with a

good response to initial hormone therapy often respond to a second or subsequent hormonal approach and may achieve long-term disease control by continuing through a series of hormonal treatments.

Corticosteroids are hormones produced by the adrenal gland which have actions in metabolism and immune modulation. These agents have antitumor activity in lymphomas and in lymphoid leukemias and are included in most treatment regimens for these diseases. Corticosteroids may be used for hormone replacement following adrenalectomy (see below) and in the management of clinical complications associated with malignancy (e.g., hypercalcemia, brain metastases). Steroids (particularly decadron) are often used as antiemetics prior to chemotherapy and may be used in the supportive care of patients with advanced disease to palliate the symptoms of general debility.

Agents acting by Hormonal Mechanisms

Hormone-Releasing Factors

The production and/or release of many hormones is governed by hormone-releasing factors from the pituitary gland. This frequently involves a feed-back loop, so that balance is achieved between the hormone-releasing factor and its target hormone. For example, thyroid-stimulating hormone (TSH, thyrotropin) from the pituitary gland stimulates release of thyroid hormone by the thyroid gland, and increased levels of thyroid hormone result in decreases in TSH.

Drugs have been synthesized which mimic (agonists) or inhibit (antagonists) the actions of specific hormone-releasing factors. Agonists for gonadotropin-releasing factor (LHRH, GnRH), including leuprolide (Leupron), buserelin, and goserelin (Zoladex), have clinical applications in the management of breast and prostate cancers. Normally, LHRH from the hypothalamus controls release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the pituitary; FSH and LH regulate circulating levels of natural estrogens, progestins, and androgens. Chronic treatment of men with high doses of LHRH agonists results in decreases in testosterone and dihydrotestosterone similar to those observed following castration. Premenopausal women treated with LHRH agonists have estrogen and progesterone levels that are reduced to those of postmenopausal women. This dramatic reduction in circulating hormones is thought to be responsible for the antitumor effects of LHRH agonists in breast and prostate cancer.

Somatostatin is a peptide hormone produced by the hypothalamus which inhibits the release of pituitary hormones (e.g., growth hormone, prolactin, thyrotropin). It also suppresses pancreatic function and inhibits gastrointestinal secretions. Somatostatin (Sandostatin) has been used to treat a broad spectrum of secretory tumors of the gastrointestinal tract, including vipomas, carcinoid syndrome, glucagonomas, insulinomas, gastrinomas, and APUD tumors.

Hormone-Synthesis Inhibitors

One approach to hormone regulation is to block the production of the hormone by inhibiting the actions of enzymes which participate in its synthesis. Most estrogen in postmenopausal women is produced outside the ovary by enzyme actions on steroid substances made by the adrenal gland. The drug aminoglutethimide blocks the action of several enzymes in this pathway, resulting in decreased production of adrenal steroids ("medical adrenalectomy"), especially the androstenedione which is converted to estrogen.

Aminoglutethimide has been used in the management of hormone-responsive breast cancer, usually after relapse during other endocrine therapies. Because the drug interferes with the production of glucocorticoids and mineralocorticoids necessary for normal metabolism and body function, patients who receive aminoglutethimide must also take steroid replacements on a daily basis to avoid developing adrenocorticoid insufficiency (Addison's disease) and orthostasis (see below).

Antihormones

The identification of specific hormone receptors on cancer cell surfaces offered new approaches to regulate the actions of hormones in promoting growth of hormonally-responsive tumors. Since the early 1970's, "antihormone" agents have been developed that interfere with the interaction between the hormone molecule and its receptor site that stimulates cell growth and proliferation.

Tamoxifen (Novaldex), the first antiestrogen to achieve widespread clinical use, has become standard first-line hormonal therapy for metastatic breast cancer and for adjuvant therapy of early stage breast cancer in postmenopausal women. Clinical trials are currently underway to test the efficacy of tamoxifen as therapy of ductal carcinoma-in situ (DCIS) and as a chemopreventive agent in women at high risk of breast cancer.

Tamoxifen acts by attaching to the cell surface estrogen receptor without initiating the intracellular processes which lead to proliferation. Its presence at the receptor site blocks the attachment of natural estrogens and thus interferes with their actions on breast cells and breast cancer cells. Tamoxifen also stimulates the production of growth factors that further modulate the proliferation of breast tissue.

While tamoxifen has antiestrogen actions on breast tissue, it has estrogen-like activities at other organ sites. Women receiving tamoxifen as adjuvant therapy have benefits similar to those of estrogen replacement therapy in lowering blood lipids and slowing bone loss. However, they also have potential side effects associated with estrogen therapy such as endometrial abnormalities and risk of thromboembolism. Other antiestrogens are currently under development that have pure antiestrogen effects (e.g., toremifene) or that may be used in tumors that have become resistant to tamoxifen.

The recent development of antiandrogens has expanded the options for medical management of advanced prostate cancer. The drug flutamide attaches to androgen receptor of prostate cancer cells and blocks the actions of testosterone and dihydrotestosterone in stimulating cell growth. Flutamide may be used as a single agent for initial hormonal treatment of advanced disease, or it may be given with an LHRH agonist (or surgical orchiectomy) as "combined androgen blockade." Casodex and nilutamide, other antiandrogens, are currently in preclinical and early clinical studies.

Surgery and Radiotherapy to Hormone-Producing Tissues

Surgical procedures to remove hormone-producing tissues were among the first attempts at endocrine therapy of cancer (e.g., oophorectomy or adrenalectomy for breast cancer, orchiectomy for prostate cancer). Radiotherapy to hormone-producing organs (e.g., ovaries) has been used to suppress hormone production in patients who could not withstand surgery.

The use of drugs to suppress hormone production has, to a great extent, replaced surgical approaches to endocrine therapy of breast cancer: LHRH agonists for "medical castration", and aminoglutethimide for "medical adrenalectomy." However, orchiectomy remains a standard approach

to endocrine management because of the simplicity of the procedure, its immediate effect, and the lack of side effects associated with drugs used for endocrine therapy of this disease.

Hormone Replacement in Patients with Cancer

Tumor involvement or specific cancer-directed therapy may destroy tissue that produces hormones necessary for normal metabolism and body function. In these clinical situations, hormone replacement therapy is necessary to maintain life. For example, patients receiving aminoglutethimide for breast cancer have suppressed production of glucocorticoids and mineralocorticoids which function in glucose metabolism and fluid and electrolyte balance, in addition to the desired suppression of androstenedione production. Thus patients receiving aminoglutethimide must also take a glucocorticoid (hydrocortisone) and may also require a mineralocorticoid (Florinef) to replace the natural corticoids normally produced by the adrenal gland. In contrast to endocrine treatment of cancer, hormones administered as replacements are given in physiologic doses rather than at the higher, pharmacologic doses used for tumor-directed therapy.

Thyroid hormone replacement is an exception because it inhibits pituitary production of thyroid stimulating hormone (TSH) which could stimulate tumor growth. It should be coded as hormonal therapy.

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Adrenocortico-tropic hormone	ACTH	Acethropan, Acthar, Adrenal Cortex hormone, Adrenocorticotrophin, Adrenocorticotropin, Corstiline, Corticotrophin, Corticotropin*, Cortrophin#, Depo-ACTH#	025933
Algestone* Acetophenide		Deladroxone#, Droxone#, SQ 15,101 (progestin)	067831
Amadinone Acetate		RS-2208 (progestin)	
Amcinonide		CL-34699, Cyclocort (glucocorticoid)	
Aminoglutethimide*	AG, AGT	Ba-16038, Cytadren, Elipten (adrenocortical suppressant)	330915
Anagestone Acetate		Anatropin# (progestin)	073880
Beclomethasone Dipropionate*		Beclometasone, Beclovent, Beconase, Sch-18020W, Vancenase, Vanceril (glucocorticoid)	
Benorterone#		SK&F-7690 (anti-androgen)	
Benzestrol		Estrogen	408889
Betamethasone*		Celestone, Sch-4831 (glucocorticoid)	039470
Betamethasone Acetate		Component of Celestone Soluspan (glucocorticoid)	
Betamethasone Benzoate*		Benisone#, Uticort, W-5975 (glucocorticoid)	
Betamethasone Dipropionate*		Component of Alphatrex, Diprolene, Diprosone, Component of Lotrisone, Psorion, Sch 11460 (glucocorticoid)	206525
Betamethasone Sodium Phosphate*		B-S-P, Component of Celestone Soluspan (glucocorticoid)	090616
Betamethasone Valerate*		Component of Betatrex, Beta-Val, Valisone (glucocorticoid)	206540
Bolasterone#		Myagen#, U-19763 (anabolic)	066233
Busrelin Acetate		Hoe 766, Suprafact	
Calusterone	CAL, CLS	Dimethyltestosterone, Methosarb#, U-22,550 (androgen)	088536
Carbenoxolone Sodium		(Biorex, England)	281727
Casodex		Anti-androgen	
Chlormadinone* Acetate	CAP	Bovisynchron, Chlormadinonu (Polish), Clordion, Gestafortin, Lormin, Lutinyl, Matrol, Synchrosyn, Synchrosyn P (progestin)	092338

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Chlorotrianisene*		Anisene, Chlorotrianisine, Chlorotris, Chlortrianizen, Clorestrolo, Clorotrisin, Hormonisene, Khlortrianizen, Merbentul, Metace, Rianil, TACE (estrogen)	010108
Chromic Phosphate P 32		Chromphosphotope#, Phosphocol P 32	
Cingestol*		Progestin	
Clocortolone Acetate		SH 818 (glucocorticoid)	
Clocortolone Pivalate*		Clocortolone trimethyl acetate, SH 863 (glucocorticoid)	
Clogestone* Acetate		AY-11,440 (progestin)	
Clomegestone* Acetate		SH 741 (progestin)	
Clometherone#		38000 (anti-estrogen)	
Clomiphene* Citrate)		Cis-Clomiphene citrate, Clomiphene A citrate, Serophene, Zuclomiphene citrate	151466 035770
Corticotropin*		See Adrenocorticotropic hormone	
Cortisone Acetate*		Cortisone, Cortogen acetate#, Cortone acetate, Component of Neosone (glucocorticoid)	009703
Cortivazol#		Glucocorticoid	080998
Cosyntropin*		Cortrosyn (adrenocorticotropic hormone)	
Cyproterone Acetate		SH 714 (anti-androgen)	081430
Decapeptyl		D-TrP6 (LH-RH)	
Delmadinone Acetate		RS-1301 (progestin, anti-androgen, anti-estrogen)	
Descinolone Acetonide#		Cl-27,071 (glucocorticoid)	044827
Desoxycorticosterone Acetate	DCA, DOCA, DOXO	Cortate acetate, Decortin, Decosterone, Decostrate#, Doca acetate#, Dorcostrin#, Percorten acetate#, Percotol, Primocort, Primocortan, Syncort (adrenocortical steroid)	009567
Desoxycorticosterone Pivalate*		Percorten pivalate# (adrenocortical steroid)	095278
Dexamethasone*∇	DECA, DM, DSM,	Aeroseb-Dex, Decaderm, Decadron Tablets, Decaspray, Component of Deronil, Component of Dexacidin, Dexasone, Dexone, Hexadrol Elixir, Hexadrol Tablets, Maxidex, Component of Maxitrol, Component of Tobradex (glucocorticoid)	345211
Dexamethasone Acetate*	DXM	Dalalone D.P., Dalalone L.A., Decadron-LA (adrenocortical steroid)	

∇ **If used in the treatment of the malignancies mentioned in the introduction on p. 37 (bold), code as hormonal therapy. For all other cancers, consider ancillary unless specifically stated to be hormonal therapy.**

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Dexamethasone Dipropionate		ST 12	
Dexamethasone Sodium Phosphate*		Dalalone, Hexadrol, Component of NeoDecadron (glucocorticoid)	
Dienestrol*	DV	Component of Estan#, Synestrol# (estrogen)	059809
Diethylstilbestrol* NCO	DEB, DES,	Bio-Des, Comestrol, Cyren A, Di-Estryl, Domestrol, Estilbin, Estrobene, Etrosyn, Fonatol, Graf-estrol, Hi-Bestrol, Nicroest, Nilestrol, Oestrogenine, Serral, Sexocretin, Sibol, Stil-Rol, Stilbestrol, Stil-betin#, Stilboestroform, Stilkap, Synth-oestrin, Syntofolin, trans-Diethylstil-bestrol, Vagestrol# (estrogen)	003070
Diethylstilbestrol Diphosphate*		Fosfestrol, Stilphostrol (estrogen)	010481
Diethylstilbestrol Dipropionate		Dibestil# (estrogen)	
Diflucortolone*		Glucocorticoid	
Diflucortolone* Pivalate		SH-968 (glucocorticoid)	
Dromostanolone Propionate	NDHT	Drolban#, Drostanolone propionate, Emdisterone, Masterid, Masteril, Masterone, Nedrotestron propionate, Permastril, 32379	012198
Dydrogesterone*		Diphaston, Dufaston, Duphaston, Duvaron, Gestatron, Hydrogesterone, Isopregnenone, Prodel, Retrone, Terolut (progestin)	092336
Equilin		7-Dehydroestrone (estrogen)	010971
Estradiol*		Component of Androgyn L.A., Aquadiol#, Diogyn, Diogynets, Estrace, Estraderm TTS, Progynon# (estrogen)	009895
Estradiol Benzoate		Progynon B (estrogen)	009566
Estradiol Cypionate*		DepGynogen, Depo-Estradiol, Component of Depo-Testadiol (estrogen)	
Estradiol Dipropionate		Ovocyclin dipropionate# (estrogen)	003354
Estradiol Mustard			112259
Estradiol Valerate*		Component of Deladumone, Delestrogen, Component of Deluteval 2X#, Component of Ditate#, Gynogen L.A. (estrogen)	017590
Estramustine		Leo 275, Ro 21-8837, Ro 22-2296/000 (chemotoxic hormone)	089201

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Estramustine Phosphate Sodium*		Emcyt, Estracyt, Estramustine phosphate disodium, Ro 21-8837/001 (chemotoxic hormone)	089199
Estriol		Theelol# (estrogen)	012169
Estrogens, Conjugated*		Component of Cyclogesterin#, Component of Milprem, Component of PMB-200, Component of PMB-400, Component of Premarin with Methyltestosterone, Premarin	
Estrogens, Esterified*		Amnestrogen#, Estratab, Component of Estratest, Menest, Component of Menrium (palliative)	
Estrone*		Theelin (estrogen)	009699
Estropipate*		Ogen, Component of Ortho-Cyclen, Piperazine estrone sulfate#, Sulestrex# (estrogen)	
Ethinyl Estradiol*		Component of Brevicon, Chee-O-Gen, Chee-O-Genf, Component of Demulan, Diogyn E, Dyloform, Esteed, Estigyn, Estinyl, Eston-E, Estoral, Ethidol, Ethinoral#, Eticyclin, Eticylol#, Etinestrol, Feminone, Ginestrene, Halodrin, Inestra, Component of Levlen, Component of Loestrin, Component of Lo/Ovral, Component of Lynoral#, Menolyn, Microfollin, Component of Modicon, Component of Nordette, Component of Norethrin 1/35E, Component of Norlestrin, Novestrol, Oradiol, Orestralyn, Palonyl Perovex, Spanestrin (estrogen)	010973
Fludrocortisone Acetate		Florinef Acetate (adrenocorticoid steroid), (salt-regulating)	
Flumethasone*		U-10,974 (glucocorticoid)	054702
Fluorometholone*		Cortilet, Delmeson, Fluoromethalone, FML Forte, FML Liquifilm, Component of FML-S Liquifilm, FML S.O.P., Component of Neo-Oxylone#, Oxylone#, U-8614 (glucocorticoid)	033001
Fluoxymesterone*	FLU, FXM, HAL	Androfluorene, Anrosterolo, Fluotestin, Fluoximesterone, Flusteron, Flutestos, Halodrin, Halotestin, Neo-Ormonal, Oralsterone, Oratestin, Ora-Testryl#, Testoral, Ultandren (androgen; palliative)	012165
Fluperolone Acetate		Methral, P-1742 (glucocorticoid)	067756
Fluprednisolone*		Alphadrol#, U-7800 (glucocorticoid)	047439
Fluprednisolone* Valerate#		Glucocorticoid	
Flurandrenolide*		Cordran, Flurandrenolone#, 33379 (glucocorticoid)	
Flurogestone Acetate		SC-9880 (progestin)	065411

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Flutamide*		Eulexin, Niftholide, Niftolide, Sch 13521	147834
Formocortal		Deflamene, Fluderma (glucocorticoid)	150527
Gestaclone		SH-1040 (progestin)	
Gosrelin		Decapeptide 1, ICI 118,630, Zoladex (LHRH agonist)	606864
Gestonorone Caproate		SH-582 (progestin)	084054
Haloprogesterone		Progestin	
Hexestrol		Cycloestrol, Estrifar, Estronal, Extra-Plex, Hexanoestrol, Hexestrofen, Hexoestrol, Hormoestrol, Sinestrol, Synestrol, Synoestrol, Synthovo, Syntrogene	009894
Hydrocortisone*	HC	Acticort, Aeroseb-HC, Cetacort, Cort-Dome, Cortef, Cortenema, Cortril, (glucocorticoid)	010483
Hydrocortisone Acetate*		Cortef acetate, Cortril acetate-AS (glucocorticoid)	000741
Hydrocortisone Sodium Phosphate*		Hydrocortone Phosphate (glucocorticoid)	
Hydrocortisone Sodium Succinate*	HDC	A-hydroCort, Solu-Cortef (glucocorticoid)	
Hydroxyprogesterone Caproate*		Delalutin#, Component of Deluteval 2X#, Gestoral LA 250, Prodrox (progestin)	017592
Ketoconazole*		Nizoral, R-41,400	
Leuprolide Acetate*		Abbott 43818, Lupron TAP, Lupron Depot (TAP), Leuprorelin, TAP-144	377526
Levothyroxine Sodium		Levothroid, Synthroid (thyroid hormone)	
Liothyronine Sodium*		Basoprocin, Cynomel, Cytomel, Ibiothyron, Tertroxin, (thyroid hormone)	080774
Liotrix		Euthroid, Thyrolar (thyroid hormone)	
Lynestrenol#		Ethynylestrenol, Exluton, Linestrenol, Org 485-50, Orgametril#, Orgametrol, Ovoresta M (progestin)	037725
Medrogestone		AY-62022 (progestin)	123018
Medroxyprogesterone Acetate*	DMPA, MAP, MPA	Curretab, Cycrin, Depo-Provera, Farlutin, Gestapuran, Lutopolar, Lutoral, Oragest, Perlutex, Prodasone, Progestal, Provera, Proverone, Repromap, Repromix, Sirprogen, U-8839, Veramix (progestin)	026386
Medrysone*		Medrocort#, U-8471 (glucocorticoid)	063278

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Megestrol Acetate*		BDH-1298, Megace, SC-10363, 5071 (progestin)	071423
Melengestrol Acetate	MGA	BDH-1921, 5373 (antineoplastic progestin)	070968
Meprednisone*		Betapar#, Sch-4358	527579
Mesterolone		SH-723 (androgen)	075054
Mestranol*		Component of Enovid, Component of Norethin 1/50 M, Component of Norinyl, Component of Norquen, Component of Ortho-Novum, Component of Ovulen (estrogen)	
Methandros-tenolone	MA	Abirol, Anabolin, Compound 17309, Crein, Danabol, Dehydromethyltestosterone, Dianabol#, Geabol, Metanabol, Metandienon, Metandrostenolone, Metasol, Methandronolone, Naposim, Nerobol, Protobolin, Stenolon (androgen)	042722
Methylprednisolone*		Dopmedrol, Medrate, Medrol, Medrone, Promacortine, Urbason (glucocorticoid)	019987
Methylprednisolone Acetate*		DepMedalone, Depo-Medrol, Component of Neo-Medrol (glucocorticoid)	048985
Methylprednisolone Sodium Phosphate		Medrol Stabisol#, U-12,019E (glucocorticoid)	048989
Methylprednisolone Sodium Succinate*		A-methaPred, Solu-Medrol (glucocorticoid)	
Methyltestosterone*		Andrometh, Androsan, Androsten, Anertan, Dumogran, Component of Estratest, Homandren, Malestrone, Metandren, Metrone, Neo-Hombreol-M#, Oreton Methyl, Component of Premarin with Methyl-testosterone, Steronyl, Synandrets, Synandrotabs, Testoviron, Testred (ICN) (androgen)	009701
Methynodiol Diacetate#		SC-19198 (progestin)	
Mibolerone		Miboleron, U-10,997 (anabolic; androgen)	072260
Mifepristone		RU 486	
Nafarelin Acetate		RS-94991-298, Synarel (LHRH agonist)	
Nafoxidine HCL	NAFO, NFX	U-11100A (anti-estrogen)	070735
Nandrolone Decanoate*		Deca-Durabolin, Nandrobolic L.A.# (androgen)	

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Nandrolone Phenpropionate*	NPP, NTPP	Durabolin, Fenobolin, Nandrobolic, Nandrolone phenylpropionate, Nerobil, Nortestosterone phenylpropionate, Phenobolin, Superanabolon (androgen)	023162
Nilutamide		Anti-androgen	
4-Nitroestrone			321803
Nitromifene Citrate		Anti-estrogen	110407
Nivazol		Win-27,914 (glucocorticoid)	
Norethandrolone		Androgen	009893
Nylestriol		49825 (estrogen)	070581 101105
Oxandrolone*		Anavar, Protivar, SC 11585, Vasorome, 8075 C. B. (androgen)	067068
Oxymetholone*	HMD	Adroyd#, Anadrol, CI-406, Drostanolone, Medrotestron, Metholone, Ora-Testryl (anabolic androgen)	026198
Oxytocin		Pitocin, Syntocinon (Tumor marker)	
Paramethasone* Acetate		Haldrone, Stemex (glucocorticoid)	
Polyestradiol Phosphate*		Estradurin, Leo 114 (estrogen)	
Prednisolone*∇	PRDL	component of Ataraxoid, Delta-Cortef, Hydeltra, Component of K Predne-Dome#, Meti-Derm, Paracortol#, Predne-Dome#, Sterane (glucocorticoid)	009120
Prednisolone Acetate*∇		DepPredalone, Meticortelone acetate, Predate, Sterane IM and IA	010966
Prednisolone Sodium Hemisuccinate∇		Meticortelone Soluble, Prednisolone sodium succinate, Solu-Decortin (glucocorticoid)	009151
Prednisolone Sodium Phosphate*∇		Hydeltrasol, Inflamase, Metreton, Component of Optimyd, Pediapred, Predate-S, PSP-IV, Solu-Predalone, Component of Vasocidin Solution (glucocorticoid)	
Prednisolone Tebutate*∇		Hydeltra-T.B.A., Predalone T.B.A. (glucocorticoid)	
Prednisone*∇	PDN, PRD, PRED	Ancortone, Dacortin, Delta-Dome#, Deltasone, Deltra, Meticorten, Orasone, Paracort#, Ultracorten (glucocorticoid)	010023
Prednival*#		W-4869 (glucocorticoid)	

∇ **If used in the treatment of the malignancies mentioned in the introduction on p. 37 (bold), code as hormonal therapy. For all other cancers, consider ancillary unless specifically stated to be hormonal therapy.**

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Pregnenolone* Succinate		Formula 405 (Non-hormonal sterol derivative)	
Progesterone*		Component of Cyclogesterin#, Gesterol 50, Lipo-Lutin#, Nalutron#, Syngesterone, Syngestrets (progestin)	009704
Quinestrol		Estrovis, W-3566 (estrogen)	
Quingestanol* Acetate		W-4540 (progestin)	
Quingestrone#		W-3399 (progestin)	
Silandrone*#		SC-16148 (androgen)	095147
Somatostatin		Growth hormone release inhibiting factor	
Somatrem		Protropin (rHGH, growth hormone)	
Somatuline			
Spironolactone	SPL	Component of Aldactazide, Aldactone, SC-9420, Spiresis, Spiridon, Spirolactone, Spirone, Uractone, Verospirone (diuretic; aldosterone antagonist)	150399
Stanolone		Neodrol	010972
Stanozolol*		WIN 14833, Winstrol (androgen)	043193
Tamoxifen Citrate*	TAM, TMX	ICI-46,474, Nolvadex, Tamofen, Tamoxifen (anti-estrogen)	180973
Testolactone*	TL	Fludestrin, SQ-9538, Teolit, Teslac, Teslak, Testolacton	023759
Testosterone		Andro 100, Component of Androgyn L.A., Mertestate#, Oreton#, Synandrol F, Testosteroid, (androgen)	009700
Testosterone Cypionate		Component of Depo-Testadiol, DepAndro 100, DepAndro 200, Depo-Testosterone, Depovirin# (androgen)	009157
Testosterone Enanthate		Andro L.A. 200, Androgen L.A., Component of Androgyn L.A., Component of Deladumone, Delatestryl, Component of Ditate# (androgen)	017591
Testosterone Ketolaurate		Androgen	
Testosterone Phenylacetate#		Androgen	
Testosterone Propionate	TP	Synandrol, Synerone# (androgen),	009166
Thyroglobulin*		Proloid, Thyractin#, Thyroprotein# (thyroid hormone)	

HORMONES OR AGENTS ACTING VIA HORMONAL MECHANISMS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Thyroid		Armour Thyroid, Thyrar (thyroid hormone)	026492
Thyrotropin			
Tigestol*		Progestin	
Toremifene Citrate		FC 1157a (anti-estrogen)	
Tralonide#		Glucocorticoid	
Trestolone Acetate#		U-15,614 (antineoplastic; androgen)	069948
Triamcinolone*		Aristocort, Kenacort (glucocorticoid)	013397
Triamcinolone Acetonide*		Azmacort, Flutone#, Kenalog, Component of Mycolog II, Component of Myco-Triacet II, Component of Mytrex, TAC-3, TAC-40#, Tramacin#, Triacet, Triamonide 40, Trymex# (glucocorticoid)	021916
Triamcinolone Acetonide Sodium Phosphate		CL-61965, CL-106359 (glucocorticoid)	
Triamcinolone Diacetate*		Aristocort, Aristocort forte parenteral, Kenacort Diacetate syrup, TAC-D#, Triamolone 40 (glucocorticoid)	
Triamcinolone Hexacetonide*	TATBA	Aristospan, CL-34433 (glucocorticoid)	
Trilostane*		Modrenal, Win 24,540 (adrenocortical suppressant)	
Trioxifene Mesylate		Compound 133314 (anti-estrogen)	
Triptorelin		CL 118,532	
Vitamin D		Cholecalciferol (functions as a hormone)	
Zoladex (see Gosrelin)			606864

NOTES

Section 6

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

It has long been recognized that immunocompromised patients are at increased risk for certain cancers. Patients treated with immunosuppressant drugs for organ transplantation have an increased incidence of squamous cell carcinomas of the skin and lip, malignant melanoma, non-Hodgkin's lymphoma (including primary lymphoma of the brain), hepatobiliary cancers, cervical carcinoma and carcinomas of the vulva and perineum, and Kaposi's sarcoma.

AIDS was first described as a new and distinct clinical entity in 1981 because of the unusual occurrence of Kaposi's sarcoma and pneumocystis pneumonia in young homosexual men. Thus, the first recognition of cancers associated with human immunodeficiency virus (HIV) infection was closely tied to the initial recognition of AIDS as a disease. Today the relationship between immunocompromise from HIV infection and the development of malignancy is widely accepted. In fact, the occurrence of Kaposi's sarcoma or non-Hodgkin's lymphoma in persons seropositive for antibodies to HIV is considered to be diagnostic of AIDS.

Studies linking population-based tumor registries with population-based AIDS registry files have provided greater understanding of the problem of cancer in patients with antibodies to HIV. In addition to Kaposi's sarcoma and non-Hodgkin's lymphoma, increased incidence of Hodgkin's disease, cancer of the anus and rectum, skin cancers other than melanoma, and cancers of the nose, nasal cavity and middle ear have been demonstrated among AIDS registry cohorts compared to the general population. Longer follow-up of these cohorts may lead to identification of other tumors as late complications of HIV infection.

Treatment of the underlying virus infection is an important aspect of cancer care for patients with AIDS-related malignancies. Most patients with an AIDS-related cancer receive therapy directed at modulating the HIV infection and/or improving immune function in addition to tumor-directed therapy. They may also receive treatment for opportunistic infections or other complications of AIDS.

Drugs for the Treatment of AIDS

Identification of the HIV retrovirus as the causative agent of AIDS and scientific studies of the virus life cycle have opened the door to pharmacologic research in antiviral drugs with potential efficacy against this agent. One step in the reproductive cycle of HIV involves the transfer of genetic information from RNA to DNA, a reverse or "retro" direction from the replication process in human cells. This transfer of genetic code is catalyzed by the enzyme reverse transcriptase. The first drugs tested for activity against HIV were developed to interfere with this part of the viral replication process, either by providing imperfect substrates for the reverse transcriptase enzyme or by inhibiting the formation or activity of reverse transcriptase.

Nucleoside analogs are drugs whose chemical structure is similar to that of the nucleosides (building blocks for DNA and RNA) which are incorporated into viral DNA by reverse transcriptase. In general, the slight differences in structure from normal nucleosides interfere with formation of the

DNA chain, terminating DNA synthesis and preventing viral replication. Well-known nucleoside analogues include azidothymidine (AZT), dideoxycytidine (ddC), and dideoxyinosine (ddI). Other nucleoside analogues that were in clinical trials by early 1992 include D4T, 3'-fluoro-ddT (a dideoxythymidine [ddT] derivative), and 3TC. Still others, such as AzdU, FddC, FlddA, and FLT are in earlier stages of the drug development process.

Some non-nucleoside agents are thought to interfere with the formation of reverse transcriptase from large proenzyme proteins or with the activity of reverse transcriptase itself. For example, both TIBO and BI-RG-587 bind to HIV reverse transcriptase, while hypericin and its related compounds may form free radicals that interact with viral DNA, in addition to their effects on reverse transcriptase.

A number of compounds under investigation as potential antiretroviral drugs appear to work at other stages in viral replication. AL 721, a dietary agent composed of various phospholipids, may inhibit the binding of HIV to target cells by distorting the virus capsule or the cell surface attachment site. Soluble CD4 and specific monoclonal antibodies act at the site of virus attachment to susceptible cells, blocking the receptor for the virus and preventing infection; dextran sulfate may also act in this manner. Compounds such as GLQ 223, castanospermine, MDL 28574, and Deoxynojirimycin (N-butyl DNJ) interfere with the synthesis and glycosylation of viral proteins. Myristic acid analogs prevent the assembly of new virus from polyproteins and viral RNA, while alpha interferon may interfere with the release of virus from infected cells. Agents such as cytotoxic lymphocytes (CTLs), immunomodulators, CD4-toxin, and other antibody-toxin complexes impact the HIV disease process by other mechanisms.

As with chemotherapy, many of the antiviral drugs are under study as combination therapy. Hopefully, synergistic or additive therapeutic effects of antiviral agents will give improved results in HIV treatment, and the use of agents with different toxicities will reduce the morbidity associated with treatment. Agents that have been tested in combination with AZT include acyclovir, alpha interferon, ampligen, ddC, dextran sulfate, and growth factors. Drug resistance is also a problem in managing patients with HIV infection, and major research efforts are directed at developing new agents for use as alternative therapies in patients with HIV infections that have become resistant to standard antiretroviral drugs.

Opportunistic Infections

Opportunistic infections are a major cause of morbidity among HIV-infected persons and represent the cause of death in approximately 90 percent of AIDS patients. Patients with AIDS are at risk for infections that are common in the general population, as well as for opportunistic infections that take advantage of the immunosuppressive effects of HIV.

Primary Pulmonary Infections

Pneumocystis carinii pneumonia (PCP) occurs in approximately 80 percent of patients with AIDS who are not receiving prophylaxis at some time during the course of their illness. Clinical presentation includes fever, respiratory symptoms, and exercise intolerance. Diagnosis depends on demonstrating the organism in sputum or bronchial brushings. Two antibiotic regimens with comparable efficacy in treatment of PCP are trimethoprim/sulfamethoxazole (oral or intravenous

administration) and pentamidine (intravenous administration). For patients who cannot tolerate either of these regimens, investigational approaches of dapsone and trimethoprim or of primaquine plus clindamycin are often used. The addition of corticosteroids (e.g., prednisone) to specific antimicrobial therapy has resulted in marked decrease in respiratory failure and death in patients with moderate or severe PCP. Effective strategies to prevent PCP include prophylaxis with oral trimethoprim/sulfamethoxazole or inhaled (aerosolized) pentamidine.

Patients with AIDS may also develop respiratory symptoms from infections caused by the fungus *Coccidioides immitis*. Pulmonary findings range from focal lung disease to diffuse pulmonary infiltrates and may be associated with skin lesions and lymph node or liver involvement. Amphotericin B is standard treatment for coccidioidosis in AIDS patients.

Histoplasmosis is endemic in the central United States. In immunocompetent persons, primary infection by *Histoplasma capsulatum* seldom advances beyond the lungs or hilar lymph nodes. However, patients with HIV infection frequently present with disseminated disease manifest by fever and weight loss. Amphotericin B is standard, effective treatment for disseminated disease; maintenance therapy may be required to prevent relapse. Disseminated histoplasmosis in a patient seropositive for HIV is considered diagnostic of AIDS.

Patients with AIDS are at high risk for reactivation of latent tuberculosis (*Mycobacterium tuberculosis*). Early in the course of HIV disease, pulmonary tuberculosis predominates; as HIV disease progresses, atypical presentations and disseminated tuberculosis become more common. Drug regimens used for tuberculosis in AIDS patients include isoniazid, rifampin, pyrazinamide, and ethambutol.

Disseminated infections with nontuberculous mycobacteria, particularly *Mycobacterium avium* complex, are among the most commonly reported bacterial infections in AIDS patients with severe immunocompromise. In contrast to tuberculosis, pulmonary symptoms are infrequent; fever, weight loss, anemia, and diarrhea are usual manifestations of infection. Antituberculous drug regimens have been disappointing in the treatment of *M. avium* complex. Prolonged therapy with combination drug regimens is used to reduce symptoms. Agents include ethambutol, clofazamine, ciprofloxacin, rifampin or rifabutin, and amikacin.

Bacterial pneumonia is also common in AIDS patients. Infections acquired in the community are often due to *Streptococcus pneumonia* or *Hemophilus influenza*. Infections acquired during hospitalization (nosocomial infections) are frequently due to Gram negative bacteria or *to Staphylococcus aureus*. Management includes antibiotic regimens appropriate for the sensitivities of the infecting organism.

Central Nervous System Infections

Clinical infections with the protozoa *Toxoplasma gondii* in patients with AIDS usually involve the central nervous system, although pneumonia and disseminated disease have been reported. The lesions demonstrated by computed tomography (CT) or magnetic resonance imaging (MRI) may resemble lymphoma or infection by other opportunistic organisms; in some cases, brain biopsy may be required to confirm the clinical diagnosis. Toxoplasmosis responds well to pyrimethamine in

combination with sulfadiazine; corticosteroids may be used in patients with cerebral edema. Alternative therapeutic approaches are under investigation for patients who are intolerant of pyrimethamine or sulfadiazine. These include combinations of pyrimethamine with clindamycin, high-dose pyrimethamine, azithromycin, clarithromycin, dapsone, and 566C80.

Cryptococcus neoformans, a yeast-like fungus, is the major cause of meningitis in AIDS patients. The organism usually infects the brain as well as the meninges, producing a diffuse encephalitis in many patients. The organism or its antigen is usually detected in spinal fluid obtained by lumbar puncture. Initial therapy for cryptococcal meningitis in AIDS patients comprises amphotericin B alone or in combination with flucytosine; following initial treatment, suppressive therapy with fluconazole is given for the life of the patient. Fungal meningitis in AIDS patients may also be caused by *Coccidioides immitis*, also treated with amphotericin B.

Central nervous system infections in patients with AIDS may also be due to *Mycobacterium tuberculosis*, presenting with clinical features of meningitis or localized lesions (tuberculomas).

Infections of the Gastrointestinal Tract

Gastrointestinal infections in patients with AIDS are a major cause of morbidity; malabsorption, diarrhea, and wasting can be linked to infection in most patients with advanced disease.

Oropharyngeal candidiasis (thrush) and vaginal infections with *Candida* species are common in immunocompromised patients. Candidal infections of the esophagus or the respiratory tract are recognized as indicator infections for AIDS diagnosis. These infections are seldom invasive or disseminated unless patients are neutropenic or have other complicating factors. Oropharyngeal candidiasis is treated by topical administration of nystatin, clotrimazole, ketoconazole, or fluconazole. Esophageal candidiasis usually requires ketoconazole; amphotericin B may be administered intravenously to patients with candidal esophagitis that is refractory to therapy with the azole drugs.

Enteric infections with the protozoa *Cryptosporidia*, *Microsporidia*, and *Isospora* may cause diarrhea, weight loss, nausea or vomiting, and abdominal pain. Therapy is predominantly supportive, emphasizing fluid balance, electrolytes, and nutrition. No specific therapies have been shown to be effective for cryptosporidiosis or microsporidiosis, although metronidazole may have some efficacy in microsporidiosis. Isosporiasis is common in Haitian or African patients with AIDS: it can be treated effectively with trimethoprim/sulfamethoxazole, pyrimethamine, metronidazole, or quinacrine.

Bacterial infections of the gastrointestinal tract are also common in AIDS patients. *Salmonella*, *Campylobacter*, and *Shigella* infections, usually self-limited in immunocompetent individuals, often require antibiotic therapy in patients with AIDS.

Viral Infections

Cytomegalovirus (CMV) infection is common among adult patients with AIDS. Retinitis due to CMV is the most frequent presentation, manifest as painless progressive visual impairment in patients with advanced disease. CMV infection at other sites may cause stomatitis, esophagitis, gastritis, and colitis in the gastrointestinal tract; hepatitis and cholecystitis; and adrenalitis with adrenal insufficiency. Antiviral therapy with gancyclovir may be limited by bone marrow toxicity in AIDS patients; foscarnet is an alternative therapy for gancyclovir-resistant infections or in patients who

cannot tolerate gancyclovir.

Progressive infections at oral and genital sites in AIDS patients are usually due to herpes simplex virus (HSV). HSV is also a common cause of esophagitis in patients with advanced disease. Acyclovir is the drug of choice in initial treatment of HSV infections as topical, oral, or intravenous therapy. Foscarnet or vidarabine may be used in acyclovir-resistant HSV.

Common viral infections due to varicella-zoster virus (VZV), such as chicken pox and shingles, may be severe and progressive in immunocompromised patients and may require treatment with acyclovir.

Other Complications of AIDS

Neurologic complications of AIDS are diverse, affecting both the central and peripheral nervous system, and may occur at all stages of disease. The clinical syndrome of AIDS dementia complex is among the most common central nervous system complications of untreated AIDS and is one of the diagnostic criteria for AIDS. Cognitive and behavioral findings (e.g., slowing of thought processes, impaired concentration, apathy, personality changes) are accompanied by impaired motor function. The clinical course of the complex is variable in progression. Accumulating evidence suggests that the clinical syndrome is due to effects of HIV on nervous system tissue, and therapy with antiretroviral agents is directed at the underlying HIV infection. Symptomatic management may include the use of neuroleptic drugs.

Progressive multifocal leukoencephalitis (PML) represents an opportunistic infection by the Jakob-Creutzfeldt (JC) virus. Focal neurologic deficits are caused by areas of demyelination, i.e., loss of the myelin sheath covering nerve fibers. While deficits are usually progressive, the clinical course is more protracted than that of other central nervous system opportunistic infections. There is no proven therapy for PML, although approaches including interferons and antiviral agents are under investigation.

Many agents used to treat AIDS and its complications have broad applications in cancer therapy. For example, antibiotics used to treat infections in AIDS patients are frequently used to treat similar infections in patients who are immunosuppressed by cancer or its treatment. Also, many chemotherapeutic agents and biological response modifiers used in cancer therapy have applications in the management of HIV infection. The inclusion of a drug in this section of Book 8 does not imply that the medication is used only for treatment of AIDS or its complications. Check sections 1-5 first for cancer-directed treatment. If not found in sections 1-5, do not code for cancer patients.

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DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat HIV Infection			
A-77003			
A 80967			
AL 721		Inhibits binding of HIV to target cells	
All-trans-retinoic acid		See Tretinoin (under investigation for Rx of lesions in Kaposi's sarcoma	
Alpha-APA derivatives		R 18893, R 89439 (alpha-anilino-phenylacetamide) (Non-nucleoside reverse transcriptase inhibitor)	
Alpha Interferon	INF	May interfere with release of virus from infected cells	
Ampligen		Poly I: Poly C12U (see Biological Response Modifiers)	
Antabuse		Disulfiram	
AS-101		Arsanilic acid	
Autologous CD8 Infusion		CD8+ T-lymphocytes from an HIV-infected person are stimulated outside the body to replicate and then are reinfused into the patient of origin.	
Azidothymidine	AZT	3'-Azido-3' Deoxythymidine, BW A 509U, Retrovir, Zidovudine (inhibits reverse transcriptase) (used in the treatment of Kaposi's sarcoma)	602670
Azidouridine			
BI-RG-587		Nevirapine (non-nucleoside reverse transcriptase inhibitor)	
BRL 61063		Exerts TNF-alpha (cachectin) inhibition.	
Castanospermine			
CD4-IgG			
CD4-PE40		Recomb. protein; consists of HIV-binding region of CD4 linked to Pseudomonas Aeruginosa exotoxin A	

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat HIV Infection (Cont'd)			
Cimetidine		Tagamet (immunomodulatory effect, interacts with H_2 receptors on cells	
Compound Q		(See GLQ223)	
Curdlan Sulfate			
D4T		Didehydrodideoxythymidine, Dideoxynucleoside (thymidine) analogue, Stavudine (Non-nucleoside reverse transcriptase inhibitor)	
Deoxynojirimycin		Butyl-DNJ, N-butyl-DNJ (Protein N-glycosylation inhibitor)	
Dideoxyadenosine	ddA		098700
Dideoxycytidine	ddC	2',3'-dideoxycytidine, HIVID, Zalcitabine, Ro 24-2027	606170
Dideoxyinosine	ddI	BMY-40900, Didanosine, 2',3'-dideoxyinosine, Videx	612049
Fluorothymidine	FLT	Synthesized fluor-substituted derivative of dideoxythymidine	
GEM 91		May inhibit HIV replication	
GLQ223		Compound Q, Trichosanthin	
GP120 vaccine		Recombinant, an envelope protein from HIV ENV 2,3 (Biocine)	
GP160 vaccine		Recombinant, an envelope protein from HIV	
HIV immunogen		Inactivated virus incorporated in modified Freund's adjuvant	
HPA-23			
Human Growth Hormone		Protropin (recombinant human growth hormone) Therapy for HIV-related wasting disease	
Hydroxychloroquine Sulfate		Plaquenil Sulfate	
Hypericin			St Johns Wort

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat HIV Infection (Cont'd)			
Insulin-like Growth Factor		IGF-1	
Imreg-1			
Imuthiol	DTC		ACTG 166
Interferon Beta Ser 17			
Interferon Gamma			
Interleukin-2,	IL-2,	Lymphokine; results in proliferation and expansion of activated T-lymphocytes	
Interleukin-2 Fusion Toxin			
Interleukin-3	IL-3	Regulates proliferation and differentiation of hematopoietic and lymphoid cells	
L-697639			
L-697661		Pyridinone (Inhibits HIV-1 reverse transcriptase)	
Lentinan			
MDL 28574			
MN rgp120/HIV-1			
Myristic acid analogs		Prevents assembly of new virus from polyproteins and viral RNA	
NAC		Mucomyst, N-acetyl cysteine (Cysteine precursor; may indirectly inhibit HIV replication)	
OTC		Procysteine, cysteine precursor	
PEG-IL-2		Polyethylene-glycol derivatized IL-2	
Pentamidine Isethionate		Pentam 300, RP 2512	620107
Pentoxifylline		Trental (see also Ancillary Drugs)	
Peptide T			
PMEA		Inhibits HIV replication	
Pneumovax			

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
		Drugs Used To Treat HIV Infection (Cont'd)	
Protease inhibitor		Ro 31-8959 (Inhibits the protease enzyme necessary for formation of functional, infectious virions	
rCD4		Receptin (Recombinant Soluble CD4)	
rgp120 CHO		Biocine	
rgp120/HIV-1 (IIIB)		Genetically engineered form of envelope glycoprotein gp120 derived from HIV-1 strain IIIB	
Ribavirin		Virazole	
Ro 24-7429		Code name for a benzodiazepine derivative with anti-HIV activity (TAT gene inhibitor)	
sT4		Recombinant Soluble T4	
3TC		Lamivudine, Analogue of cytidine; inhibits HIV replication through viral DNA chain termination	
Thymic Humoral Factor	THF	Increases number of T-lymphocytes and augments cell-mediated immunity	
Thymopentin	TP-5	Regulates and enhances function of peripheral T cells	
TIBO derivatives		R 62913 (Non-nucleoside reverse transcriptase inhibitor)	
U-85961		(bis(heteroaryl)piperazine compound (BHAP)	
U-87201E		Non-nucleoside reverse transcriptase inhibitor (bis(heteroaryl)piperazine compound (BHAP)	
U-90152		BHAP compound	
VaxSyn		Recombinant gp160 (See GP160 vaccine)	
Wobenzym		Suppresses inflammatory response in AIDS patients	
Zidovudine*	AZT	(see Azidothymidine, Section 1.)	602670
935U83		Inhibits the HIV reverse transcriptase	

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat Opportunistic Infections And Other Complications Associated With AIDS			
Acyclovir Sodium		Zovirax (Rx of HSV and VZV infections; antiviral)	
Albendazole		Antifungal agent; Rx of microsporidiosis	
All-trans retinoic acid		Under investigation for Rx of Kaposi's sarcoma	
Alpha Interferon		Rx of Kaposi's sarcoma	
Amikacin Sulfate		Amikin (antimycobacterial drug)	
Amphotericin B	AMB	Fungizone, Component of Mysteclin-F# (antifungal)	
Amphotericin B Lipid Complex		(ABLC)	
Anti-B4-blocked Ricin			
Ara-C		Cytarabine (under investigation for Rx of Progressive Multifocal Leukoencephalopathy (PML))	
Atovaquone		Mepron, 566 (therapy for Pneumocystis carinii pneumonia; under investigation for Rx of cryptosporidiosis)	
Azithromycin		Zithromax (Rx of Chlamydia; under investigation for Rx of Mycobacterium Avium Complex (MAC), toxoplasmosis, and cryptosporidiosis	
BACI		Bovine anti-Cryptosporidium Immunoglobulin (Under investigation for Rx of cryptosporidiosis)	
Bactrim/Septra	TMP/SMX	Cotrim, Trimethoprim (TMP)-sulfamethoxazole (SMX)	
Butoconazole		Femstat (topical antifungal agent)	
BV ara-U			
BW 256U87			
BW 348U87			
BW 882C87			
Capreomycin Sulfate		Capastal sulfate (antimycobacterial drug)	
Ceftriaxone Sodium		Rocephin	
Ciprofloxacin HCl		Cipro (antimycobacterial drug)	

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat Opportunistic Infections And Other Complications Associated With AIDS			
Clarithromycin		Biaxin (antimycobacterial drug)	
Clindamycin		Cleocin (antiparasitic; Rx of PCP)	
Clofazimine		Lamprene (antimycobacterial drug)	141046
Clotrimazole		Canestin, Component of Lotrimax, Lotrimin, Component of Lotrisone, Mycelex, Mycelex G (Rx of candidiasis) (topical antifungal antibiotic)	
CMVIg		Cytomegalovirus Immune Globulin	
Corticosteroids, adjunctive		Rx of Pneumocystis pneumonia carinii	
Cycloserine		Seromycin (antimycobacterial drug)	
Dapsone		Antiparasitic	006091
Daunorubicin, liposome-encapsulated		Daunoxone	
Dextran Sulfate		Uendex	
Dianoxide Furoate		Antibiotic; Rx of amebiasis	
Doxorubicin, liposome-encapsulated		Under investigation for Rx of Kaposi's Sarcoma	
Dronabinol		See Tetrahydrocannabinol (appetite stimulant)	134454
Econazole		Spectazole (antifungal)	
Eflornithine HCl	DFMO	Ornidyl (Rx of Pneumocystis pneumonia carinii)	
Erythropoietin		EPO Epogen, Epoietin Alfa, Eprox, rHu-EPO, Procrit (stimulates RBC production)	628281
Ethambutol HCl		Myambutol (Under investigation for Rx of Mycobacterium Avium Complex (MAC; Rx of tuberculosis)	
Ethionamide		Trecator-SC (antimycobacterial drug)	
Famciclovir		BRL 39123A	
Fansidar		Prophylaxis for PCP and toxoplasmosis	
FIAU		(Rx for cytomegalovirus)	

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat Opportunistic Infections And Other Complications Associated With AIDS			
Fluconazole		Diflucan (antifungal; Rx of Candidiasis)	
Flucytosine	5-FC	Ancobon (antifungal; adjunct to Amphotericin B)	
Foscarnet Sodium	PFA	EHB 776, Foscavir, Trisodium phosphonoformate (Rx of cytomegalovirus retinitis and HSV infections)	
Furazolidone		Furoxone (Antimicrobial used in the oral RX of giardiasis	
G-CSF		Filgrastim, Neupogen (Granulocyte Colony-stimulating factor; Adjunct of Ganciclovir therapy; treatment of neutropenia	
Gamma Interferon		Actimmune	
Ganciclovir	DHPG, 2'NDG	BIOLF-62, BW 759U, Cytovene, RS-21592 (Rx of AIDS-related retinopathies)	
GM-CSF		Leukine, Sargramostim (Granulocyte macrophage colony-stimulating factor	
Guanfacine		Rx of AIDS Dementia Complex	
HPMPC		Under investigation of asymptomatic CMV infections	
Imipenem-Cilastatin		Primaxin, component of (antibiotic; antimycobacterial)	
Iodoquinol		Yodoxin (Antibiotic; Rx of amebiasis)	
Isoniazid*	INH	Cotinazin, Dinacrin#, Ditubin#, Isolyn#, Isonicotinic acid hydrazide, Laniazid, Niconyl#, Nidaton#, Nydrazid, Rimifon#, Teebaconin, Tisin#, Tyvid#	
Isoprinosine			
Itraconazole	ITZ	R-52,211, Sporonax (antifungal) (Rx of Candidiasis)	
IVIG		Intravenous immunoglobulin; provides passive immunity (viral infections)	
Ketoconazole		(antifungal)	
L-693,989		Activity against PCP and Candida	

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat Opportunistic Infections And Other Complications Associated With AIDS			
Letrazuril		Rx of Cryptosporidiosis	
Lomotil		Anti-diarrhea	
Malathion		Ovid (Rx for ectoparasites)	
Megestrol Acetate		Megace (appetite stimulant) (see Hormones)	
Metronidazole		Flagyl, Component of Flagyl I.V. RTU, Metro I.V., Protostat, Satric (Rx of microsporidiosis)	050364
Mexiletine HCl		Mexitil (Therapy for HIV-related neuropathy)	
Miconazole		Micatin, Monistat (topical antifungal agent)	
MSL-109		Antiviral monoclonal antibody with activity against CMV strains	
Mucopirocin		Bactroban	
Nimodipine		Nimotop (Oral calcium-channel blocking agent under investigation for the Rx of AIDS dementia complex	
Nystatin		Mycostatin, Nilstat, Nystex, component of Mycolog II, component of Myco-Triacet II, component of Mytrex, component of Terrastatin, component of Tetrastatin (topical antifungal antibiotic) (Rx of Candidiasis)	
Ofloxacin		Floxin (antimycobacterial drug)	
Para-aminosalicylic acid		PAS, Teebacin (antimycobacterial drug)	
Paromomycin Sulfate		Humatin (antibiotic) (Under investigation for Rx of cryptosporidiosis	
Pefloxacin		Under investigation for Rx of PCP	

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat Opportunistic Infections And Other Complications Associated With AIDS			
Pentamidine		Lomidine, NebuPent, Pentam 300 (Rx or prophylaxis of PCP) (antiparasitic)	
Peptide T		Under investigation for Rx of HIV-associated neuropsychiatric impairment and neuopathy	
Peridex		Chlorhexidine gluconate (Under investigation for the prevention of oral candidiasis	
Permethrin		(topical agent used for ectoparasites)	
Piritrexim Isethionate		Rx of PCP	
Platelet Factor 4		Under investigation for Rx of Kaposis's sarcoma	
Podofilox		Condylox (Rx of human papilloma virus (HPV)	
Primaquine Phosphate		Used in combination with Clindamycin for Rx of PCP (antiparasitic)	
Pyrantel Pamoate		(antihelminthic)	
Pyrazinamide	PZA	Rx of tuberculosis	
Pyrimethamine		Daraprim, Component of Fansidar, Malocide (Rx of toxoplasmosis) (antiparasitic)	
Quinacrine		Atabrine (antiparasitic)	
Ranitidine HCl		Zantac	
Retinoic Acid		(Rx of molluscum contagiosum virus)	
Rifabutin		Ansamycin, Mycobutin (Rx of Mycobacterium Avium complex (MAC))	113926
Rifampin		Rifadin, Rimactane (Under investigation for Rx of MAC; Rx of tuberculosis)	
SP-PG		Inhibits angiogenesis; under investigation for Rx of Kaposis's sarcoma	
Sparfloxacin		(antimycobacterial)	
Spiramycin		Rx of cryptosporidiosis	055926

DRUGS USED IN THE TREATMENT OF AIDS AND ITS COMPLICATIONS

Generic Name	Short Names	Synonyms and Brand or Trade Names	+NSC No.
Drugs Used To Treat Opportunistic Infections And Other Complications Associated With AIDS			
Spiramycin HCL			064393
Streptomycin			
Sulfadiazine		(antiparasitic)	
Sulfamethoxazole		Rx of PCP	
Terconazole		Terazol (topical antifungal agent)	
Thiabendazole		Mintezol (Rx of strongyloidiasis)	
Tioconazole		Vagistat (antifungal)	
TLC G-65		Rx of Mycobacterium Avium Complex	
TNP-470		AGM-1470# (inhibits angiogenesis)	
Trifluridine	TFT	Viroptic, See F3TDR	075520
Trimethoprim	TMP	Trimpex, Proloprim (Rx or prophylaxis of PCP) (antiparasitic)	106568
Trimetrexate		Salvage therapy for PCP	
Trospectomycin Sulfate		Antibiotic for Rx of oral chlamydia and gonorrhea; under investigation for Rx of Mycobacterium Avium Complex	
Vidarabine			
WR 6026		Therapy for Pneumocystis carinii pneumonia	
566C80			

NOTES

PROTOCOL INVESTIGATORS

AFIP	Armed Forces Institute of Pathology
AJC	American Joint Commission, College of Surgeons (ACOS)
AMLI	Acute Myelocytic Leukemia Intergroup
BTSG	Brain Tumor Study Group
BTS	British Testicular Study
CALGA	Cancer and Leukemia Group A
CALGB	Cancer and Acute Leukemia Group B
CCSG	Children's Cancer Study Group
CCDEP	Central Clinical Drug Evaluation Program
COG	Central Oncology Group
CRC	Cancer Research Campaign United Kingdom
DFCC	Dana-Farber Cancer Center
ECOG	Eastern Cooperative Oncology Group
EORTC	European Organization for Research and Treatment of Cancer
ESSG	Ewing's Sarcoma Study Group
FDA	Federal Drug Administration
FIGO	International Federation of Gynecology and Obstetrics
GITSG	Gastrointestinal Tumor Study Group
GOG	Gynecologic Oncology Group
HNCP	Head and Neck Contracts Program
HTSG	Hepatic Tumor Study Group
IARC	International Agency for Research on Cancer
IFAC	International Federation Against Cancer
INTERG	Intergroup (Other)
IRS	Intergroup Rhabdomyosarcoma Study
LCSG	Lung Cancer Study Group
MAOP	Mid-Atlantic Oncology Program
MARCOG	Mid-Atlantic Regional Co-Op Oncology Group
NABMTG	North American Bone Marrow Treatment Group
NCCTG	North Central Cancer Treatment Group
NCI	National Cancer Institute
NCOG	Northern California Oncology Group
NETDC	New England Trophoblastic Disease Center, Harvard Medical School
NORCA	Nutrition Oncology Research Cooperative Association
NPCTG	National Prostatic Cancer Treatment Group
NSABP	National Surgical Adjuvant Project for Breast and Bowel Cancers
NWTS	National Wilms' Tumor Study
UORG	Uro-Oncology Research Group
POA	Piedmont Oncology Association
POG	Pediatric Oncology Group
PVACCG	Pacific VA Cancer Chemotherapy Group
PVSG	Polycythemia Vera Study Group

PROTOCOL INVESTIGATORS (cont'd)

RMS	Intergroup Rhabdomyosarcoma Study, Children's Cancer Study Group
RTOG	Radiation Therapy Oncology Group
SECSG	Southeastern Cancer Study Group
SIOP	International Society of Pediatrics Oncology
SWOG	Southwest Oncology Group
TPNG	Total Parenteral Nutrition Group
UICC	International Union Against Cancer
VACG	Veterans Administration Chemotherapy Group
VALG	Veterans Administration Lung Group
VASAG	Veterans Administration Surgical Adjuvant Group
VASOG	Veterans Administration Surgical Oncology Group
WCCG	Western Cancer Chemotherapy Group
WCG	Weski Cancer Group
WHO	World Health Organization
WTSG	Wilms' Tumor Study Group

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