

CHAPTER

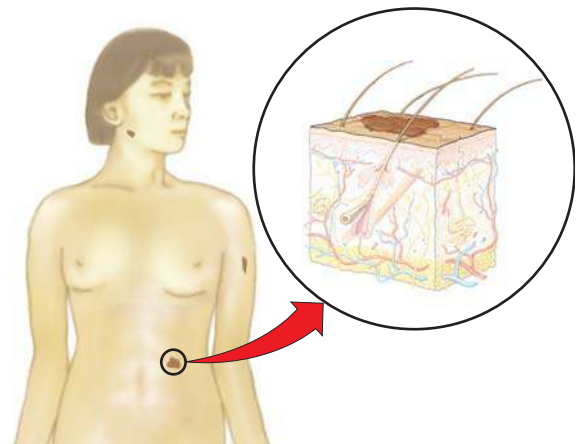
18

► ONCOLOGY

Terms in Oncology— Cancer and Its Causes

After studying this chapter, you will be able to:

- 18.1** Name the types of cancers, discuss the major pathological conditions, and list some of their possible causes
- 18.2** Define the combining forms and suffixes used in building words that relate to oncology
- 18.3** Identify the meaning of related abbreviations
- 18.4** Name the laboratory tests and clinical procedures used in testing and treating cancer
- 18.5** Describe pathological terms related to cancer
- 18.6** Explain the meaning of surgical terms related to cancer
- 18.7** List common pharmacological agents used in treating cancer



Tumors: Types and Causes

Tumors

Oncology is the study, diagnosis, and treatment of tumors. **Tumors** or **neoplasms** are growths made up of cells that reproduce abnormally. Cells in the body normally reproduce only at a rate to replace cells that have died. Cells also have a mechanism that signals them to die when they have passed a certain point of usefulness. Tumors are made up of cells that seem to be missing the mechanism that tells them either to stop reproducing or to die. The death of normal cells in a normal time cycle is called **apoptosis**.

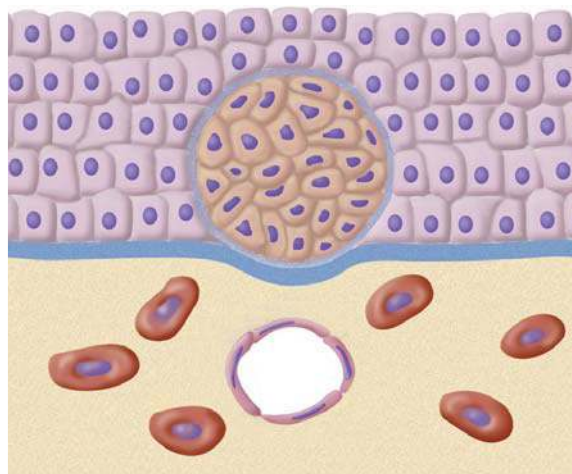
Tumors can be **benign** (masses but containing cells that resemble the site of origin) or **malignant** (consisting of abnormal or mutated cells). Figure 18-1 shows a benign encapsulated tumor (a) and a malignant tumor (b). Tumors can be **encapsulated** (retained within a border of connective tissue) or they may reproduce in uncontrolled patterns. Most benign tumors are not life-threatening unless they grow in such a way that they damage essential organs. Malignant tumors can be life-threatening if they are not treated and they spread.

A **carcinoma**, the most common type of cancer, originates from epithelial tissue. Also called **solid tumors**, carcinomas make up about 90 percent of all tumors. Common sites are in the skin, lungs, breasts, colon, stomach, mouth, and uterus. Carcinomas spread by way of the lymphatic system.

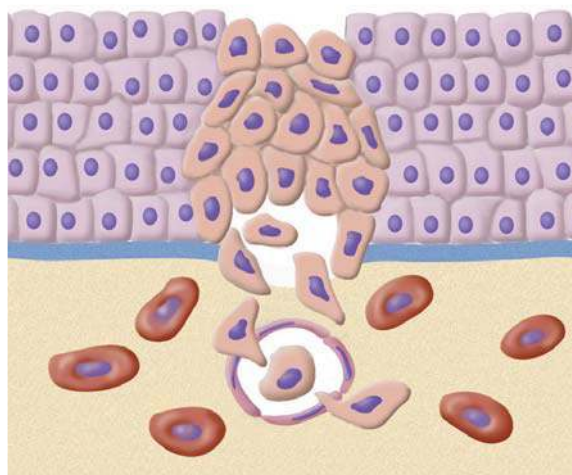
A **sarcoma**, which is fairly rare, originates in muscle or connective tissue and lymph. A *mixed-tissue tumor* derives from tissue that is capable of

The American Cancer Society (www.cancer.org) offers continually updated information about prevention, treatment, support, and volunteering opportunities.

FIGURE 18-1 (a) Benign tumors are not cancerous. In many cases, they do not have to be removed. (b) Malignancies have to be treated or they will spread.



(a)



(b)

separating into either epithelial or connective tissue because it is composed of several types of cells. Such a tumor can be found in the kidneys, ovaries, or testes. Mixed-tissue tumors can be **teratomas**, growths containing bone, muscle, skin, and glandular tissue as well as other types of cells. There is also a class of cancers that arise from blood, lymph, or nervous system cells. Cancers such as leukemia fall into this category. As mentioned in Chapter 12, some leukemias are also sarcomas. Benign tumors are not life-threatening unless they impact organs (Figure 18-1a). They are made up of **differentiated** cells that reproduce abnormally but in an orderly fashion. Some benign tumors can cause pain from pressure exerted on an organ or tissue. Often, removal cures the problem.

Malignant tumors are **invasive**, extending beyond the tissue to infiltrate other organs (Figure 18-1b). Malignant tumors can be life-threatening. These tumors are made up of **dedifferentiated** cells, which lack the normal orderly arrangement of the cells from which they arise. *Undifferentiated* cells lack a defined mature cell structure. This loss of cell differentiation is called **anaplasia**.

Any abnormal tissue development is known as **dysplasia** or **heteroplasia**. The first stages of cancer development may be classified as dysplasia because they represent the beginning of abnormal tissue development. Detection of cancers at this early stage plays a vital role in treatment. The next stage may be a *carcinoma in situ*, a tumor in one place that affects all

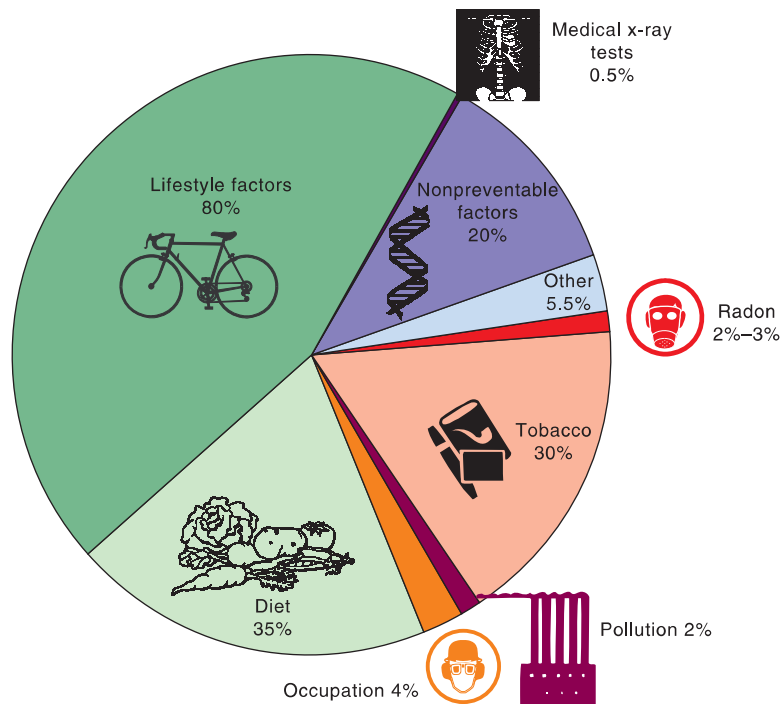


FIGURE 18-2 Many cancer deaths could be prevented by lifestyle and environmental changes.

layers of tissue. Finally, a *malignancy* occurs when the cells break loose and become invasive to surrounding tissue. The spread of a malignancy to other areas of the body is called **metastasis**. In earlier chapters, you learned about *homeostasis*, the maintaining of balance throughout the body. Metastasis is a state of imbalance, with cells spreading uncontrollably.

Causes of Cancer

Tumors appear under a number of different circumstances or combination of circumstances. One such is the exposure to *carcinogens*, cancer-causing agents. Carcinogens include environmental agents, such as chemicals, radiation, and viruses. Many chemicals, environmental factors, and viruses may be carcinogens, but they have not been tested thoroughly, and may not be for years. The process of proving a link between an agent and a resulting cancer is a long and tedious process. In some localities, cancer clusters (an unusually high number of cancers in a limited area) have led researchers to classify certain chemicals as carcinogens. Other agents, such as tobacco in any form, food additives, pharmaceutical agents, asbestos, insecticides, some dyes, and certain hormones, are also known carcinogens. Figure 18-2 is a chart giving the percentages of cancer deaths from preventable factors.

Another cause of cancer is from an inherited defect transmitted from parent(s) to child in the genetic material of the cell, *DNA* (*deoxyribonucleic acid*). Figure 18-3 shows DNA in the nucleus of a cell. DNA contains coded material called genes that direct the growth of cells and the production of new proteins. When a cell divides into two cells in normal cell growth, exactly the same DNA appears in both cells. The body is constantly producing new cells. This process is called **mitosis**. Some genes in DNA may become defective in a process of change, called **mutation**. Most mutated cells either do not survive or are destroyed by the normal immune system. However, each new generation of malignant cells will increase the mutation of

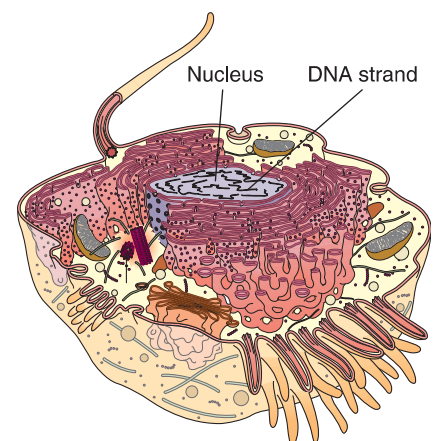


FIGURE 18-3 DNA strands contain genetic information in the cell.

the cell. The longer the malignancy has been established, the more mutated. A pathologist will assess this.

Mutations that do survive are then replicated over and over again and can lead to malignancies. Mutated DNA can predispose someone to cancer through heredity. Breast cancer and ovarian cancer are examples of largely inherited cancers. People with a family history of cancers are more likely to develop cancer. That does not mean, however, that people with no family history of a certain cancer (such as breast cancer) should ignore regular checkups. Nor does it mean that if your mother had breast cancer, you and your sisters are destined to have breast cancer. The other function of DNA is to copy its code onto another molecule called RNA (*ribonucleic acid*). RNA carries coded messages from the nucleus to the outer material of the cell, the **cytoplasm**. The messages signal what proteins are needed. Viruses heighten cancer risk (such as Kaposi's sarcoma from HIV). A virus that causes cancer is known as an *oncogenic* agent. An **oncogene** is a DNA fragment that converts normal cells into malignancies.

The National Cancer Institute (www.cancer.gov) is a governmental source for information about types of cancers, treatments, research, and many other cancer topics.

VOCABULARY REVIEW

In the previous section, you learned terms relating to oncology. Before going on to the exercises, review the terms below and refer to the previous section if you have questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. These etymologies (word histories) are for your information only. You do not need to memorize them.

Term	Meaning
anaplasia [ăn-ă-PLĀ-zhē-ă] ana-, up + -plasia, formation	Loss of cell differentiation.
apoptosis [ă-pöp-TŌ-sīs] Greek, a dropping off	Normal death of cells.
benign [bě-NĪN] From Latin <i>benignus</i> , kind	Encapsulated; not malignant.
cytoplasm [SĪ-tō-plāzm] cyto-, cell + -plasm, formation	Outer portion of a cell surrounding the nucleus.
dedifferentiated [dē-DĪF-ēr-ĕn-shē-Ā-těd] de-, away from + differentiated	Lacking in normal orderly cell arrangement.
differentiated [dĭf-ēr-ĒN-shē-ā-těd]	Growing in an orderly fashion.
dysplasia [dĭs-PLĀ-zhē-ă] dys-, abnormal + -plasia	Abnormal tissue growth.
encapsulated [ĕn-KĀP-sū-lā-těd]	Held within a capsule; benign.
heteroplasia [HĒT-ēr-ō-PLĀ-zē-ă] hetero-, different + -plasia	Dysplasia.
invasive [ĭn-VĀ-sĭv]	Infiltrating other organs; spreading.
malignant [mă-LĪG-nănt]	Growing uncontrollably.
metastasis [mě-TĀS-tă-sīs] Greek: <i>meta</i> -, beyond + <i>stasis</i> , a standing still	Spread of malignant cells to other parts of the body.

Term	Meaning
mitosis [mī-TŌ-sīs] From Greek <i>mitos</i> , thread	Cell division.
mutation [myū-TĀ-shŭn]	Alteration in DNA to produce defective cells.
neoplasm [NĒ-ō-plāzm] neo-, new + -plasm	Tumor; new growth.
oncogene [ŌNG-kō-jēn] onco-, tumor + gene	DNA fragment that causes malignancies.
sarcoma [săr-KŌ-mă] Greek <i>sarkoma</i> , fleshy growth	Relatively rare tumor that originates in muscle, connective tissue, and lymph.
solid tumor	Carcinoma; most common type of tumor.
teratoma [těr-ă-TŌ-mă] Greek <i>teras</i> , monster + -oma, tumor	Growth containing several types of tissue and various types of cells.
tumor [TŪ-mŏr] Latin, a swelling	Growth made up of cells that reproduce abnormally.

CASE STUDY

Finding a Symptom

Alicia Alvarez is fifty years old, has no family history of cancer, and is having her annual gynecological examination. Dr. Josiah Williams is a gynecologist specializing in the care of menopausal women. He notices a grayish area on the left side of Alicia's vulva. He recommends an immediate biopsy be taken in his office. Alicia expresses surprise and mentions that there is no cancer history in her family. Dr. Williams explains to Alicia that family history is just one factor in cancer of the female reproductive system. He also points out that a biopsy does not necessarily mean the tissue is cancerous; the discoloration may also be the result of

an infection or irritation. Alicia agrees to have the biopsy.

Critical Thinking

1. The discoloration on Alicia's vulva is possibly a type of skin cancer appearing on a part of the female reproductive system. Skin discolorations are usually not cancer. If you have a biopsy and the results are negative, should you still examine the skin area every few months? Why?
2. Name two cancers of the female reproductive system.

TUMORS: TYPES AND CAUSES EXERCISES

Find a Match

Write the word from this list that matches each statement.

benign deoxyribonucleic acid anaplasia teratoma carcinogen metastasis differentiated malignant dedifferentiated invasive sarcoma oncogene

3. Lacking in normal orderly cell arrangement _____
4. Encapsulated, not malignant _____
5. Infiltrating other organs; spreading _____
6. Growing uncontrollably _____

7. Genetic material of a cell _____
8. DNA fragment that causes malignancies _____
9. Growth containing several types of tissue and various types of cells _____
10. Tumor that originates in muscle, connective tissue, and lymph; fairly rare _____
11. Spread of malignant cells _____
12. Cancer-causing agent _____

Spell It Correctly

For each of the following words, write C if the spelling is correct. If it is not correct, write the correct spelling.

- | | |
|----------------------|----------------------------|
| 13. metastasis _____ | 16. dedifferentiated _____ |
| 14. apoptosis _____ | 17. deoxirebonuclaic _____ |
| 15. carsinoma _____ | 18. citoplasm _____ |

Match the Term

Write the letter of the meaning of the term in the space provided. These terms describe tumor appearance:

- | | |
|------------------|--|
| 19. verrucous | a. filled with fluid |
| 20. polypoid | b. wartlike in appearance |
| 21. inflammatory | c. containing glandular sacs |
| 22. cystic | d. having open wounds |
| 23. follicular | e. large and fleshy |
| 24. ulcerating | f. containing dead tissue |
| 25. medullary | g. containing polyps |
| 26. necrotic | h. having a red and swollen appearance |

Combining Forms and Abbreviations

The lists below include combining forms, suffixes, and abbreviations that relate specifically to oncology. Pronunciations are provided for the examples.

COMBINING FORM	MEANING	EXAMPLE
blast(o)	immature cell	<i>blastoma</i> [blās-TŌ-mă], tumor arising from an immature cell
carcin(o)	cancer	<i>carcinogen</i> [kār-SĪN-ō-jěn], cancer-causing agent
muta	genetic change	<i>mutation</i> [myū-TĀ-shŭn], process of genetic change
mutagen(o)	genetic change	<i>mutagenic</i> [myū-tă-JĒN-ĭk], causing genetic change
onc(o)	tumor	<i>oncology</i> [ŏn-KŌL-ō-jē], treatment and study of tumors
radi(o)	radiation, X rays	<i>radiation</i> [rā-dē-Ā-shŭn], process of exposure to or treatment with above-normal levels of radiation

SUFFIX	MEANING	EXAMPLE
-blast	immature cell	<i>leukoblast</i> [LŪ-kō-blăst], immature
-oma (<i>pl.</i> , -omata)	tumor	<i>fibroma</i> [fī-BRŌ-mă], benign tumor arising from connective tissue
-plasia	formation (as of cells)	<i>dysplasia</i> [dīs-PLĀ-zhē-ă], abnormal tissue development
-plasm	formation (as of cells)	<i>neoplasm</i> [NĒ-ō-plăsm], abnormal tissue formed by abnormal cell growth
-plastic	formative	<i>neoplastic</i> [nē-ō-PLĀS-tĭk], growing abnormally (as a neoplasm)

ABBREVIATION	MEANING	ABBREVIATION	MEANING
ALL	acute lymphocytic leukemia	ER	estrogen receptor
AML	acute myelogenous leukemia	METS, mets	metastases
bx	biopsy	NHL	non-Hodgkin's lymphoma
CA	carcinoma	PSA	prostate-specific antigen
CEA	carcinogenic embryonic antigen	rad	radiation absorbed dose
chemo	chemotherapy	RNA	ribonucleic acid
CLL	chronic lymphocytic leukemia	RT	radiation therapy
CML	chronic myelogenous leukemia	TNM	tumor, nodes, metastasis
DES	diethylstilbestrol	Tx	treatment
DNA	deoxyribonucleic acid	XRT	x-ray or radiation therapy
DRE	digital rectal exam		

CASE STUDY

Being Careful

Frightened by Alicia's news of possible cancer, Peter Alvarez, her husband, went to Dr. John Chin, an internist, for a physical. He had not had a physical in the last five years, but felt now that he should. Peter is 50 years old and has no history of cancer. Dr. Chin had the nurse draw blood for various tests.

Dr. Chin explained that one of the tests that should be done on a yearly basis for males over the age of 45 is the PSA.

Critical Thinking

27. What part of the body does the PSA test evaluate?
28. Peter had not had a physical in five years. Why is it important to be checked on a yearly basis for certain types of cancer when you reach certain ages?

COMBINING FORMS AND ABBREVIATIONS EXERCISES

Build Your Medical Vocabulary

Using the combining forms and suffixes in this chapter and in Chapter 3, write a term for each definition.

- | | |
|--|--------------------------------------|
| 29. therapy using radiation _____ | 33. tumor of the meninges _____ |
| 30. bone tumor _____ | 34. cancer of the lymph system _____ |
| 31. immature red blood cell _____ | |
| 32. fluid-filled glandular carcinoma _____ | |

Check Your Knowledge

For each of the following cancers, name the body part involved. Refer to Chapter 3 if you need to review combining forms for body parts.

- | | |
|-------------------------|--------------------------|
| 35. adenoma _____ | 38. retinoblastoma _____ |
| 36. neuroblastoma _____ | 39. lymphocytoma _____ |
| 37. myoma _____ | |

Find the Terms

Use the combining forms above to complete the following words.

40. tumor consisting of immature cells: _____ oma
41. treatment of tumors: _____ therapy
42. agent that promotes a genetic change: _____ gen
43. impenetrable by radiation: _____ opaque
44. destructive to cancer cells: _____ lytic

Root Out the Meaning

Divide each of the following words into word parts. Give the definition of the whole word and of each part.

- | | |
|--------------------------|--------------------------|
| 45. androblastoma _____ | 53. adenocarcinoma _____ |
| 46. carcinogenesis _____ | 54. oncologist _____ |
| 47. mutagenesis _____ | 55. oncocyte _____ |
| 48. oncogene _____ | 56. adenoma _____ |
| 49. radiotherapy _____ | 57. astrocytoma _____ |
| 50. radionecrosis _____ | 58. chondrosarcoma _____ |
| 51. hypernephroma _____ | 59. liposarcoma _____ |
| 52. leiomyosarcoma _____ | 60. lymphoma _____ |

Diagnostic, Procedural, and Laboratory Terms

Cancer is a general term referring to any of various diseases with uncontrolled cell growth. Researchers have developed tests to detect many cancers and, in some cases, to detect cancer at its earliest stages. Survival rates have

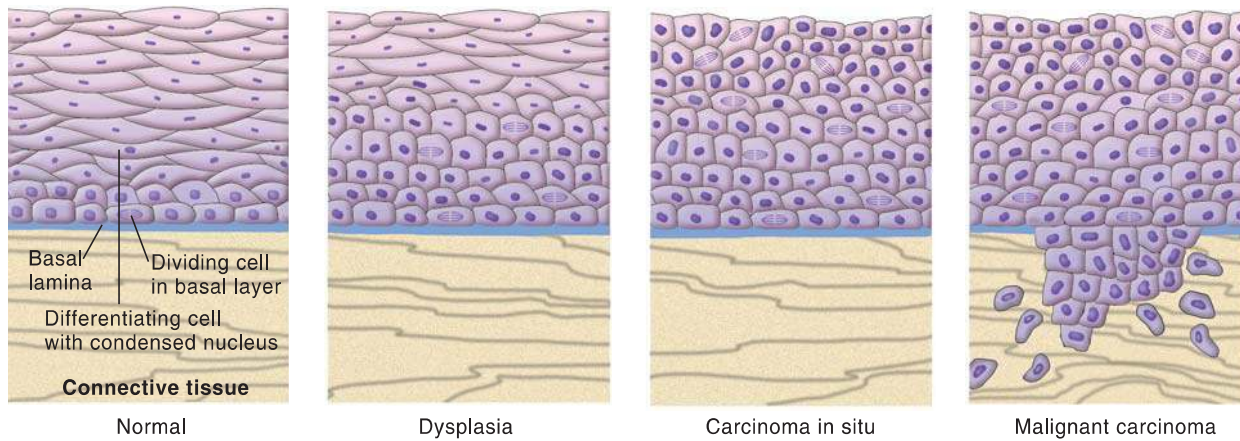


FIGURE 18-4 A Pap smear is examined under a microscope to see if it is normal, has some dysplasia, if a carcinoma in situ is present, or if malignant carcinoma already exists.

improved because of diagnostic techniques. The sooner cell growth can be normalized, the greater the possibility of survival.

Routine medical checkups often include tests for cancer. Adult females usually have a *pap smear*, a test for cervical and uterine cancer (Figure 18-4), along with a breast examination, including palpation of the breasts for lumps. Adult males usually have a blood test called a PSA (*prostate-specific antigen*) that can detect prostate cancer. A *digital rectal exam (DRE)* is also a prostate cancer screening method. Doctors also check male testicles for any signs of tumors. Testicular cancer occurs fairly commonly.

Normal adult checkups usually include auscultation of the lungs, palpation of the abdomen, inspection of the rectum and an occult stool test (particularly if the patient has a family history of colon cancer or has some possible symptoms), and a discussion of any symptoms that may need further investigation. Some blood tests indicate a particular type of cancer. For example, patients with gastrointestinal tumors usually have *carcinoembryonic antigens (CEA)* in their bloodstream. An *alphafetoprotein test (AFP)* is given to detect the presence of liver or testicular cancer. *HCG* or *human chorionic gonadotropin* is usually present in the blood of patients with testicular cancer. *CA-125 (cancer antigen 125)* is a protein produced by ovarian cancer cells. Colorectal cancers can be detected by a colonoscopy.

With advances in understanding genetic markers for certain diseases, preventive measures can be offered to patients who have a genetic marker for a certain cancer. This has been used effectively, for example, in the prevention of breast cancer for people with *Her-2nu* genes, which indicate a high likelihood of developing breast cancer.

Imaging techniques now provide a detailed picture of various parts of the body. MRIs, CAT scans, mammograms, and the insertion of lighted instruments to view various body parts have advanced diagnostic techniques. Any tumors that are found are categorized by **grade**, the maturity of the tumor, and **stage**, the degree of spread or metastasis of the tumor. A common method for grading is the **TNM (tumor, node, metastasis) system**, which numbers the extent of the tumor, the extent of lymph nodes affected, and the degree of metastasis. This grading is most often done by examination under a microscope. Table 18-1 describes the grading used in the TNM system.

TABLE 18-1 The TNM System of Grading

Classification	Size Indicator	Meaning
T (tumor)	0–4	0 means no tumor; 1–4 means progressively larger tumors.
N (node)	0–4	0 means no lymph node involvement; 1–4 indicates extent to which cancer affects nodes.
M (metastasis)	0–3	0 means no metastasis. 1–3 are the stages of metastasis.

Tumors are also characterized by appearance under the microscope, and by observations made on visual examination. Some of the classifications of tumors are:

- **alveolar**, forming small sacs shaped like alveoli
- **anaplastic**, reverting to a more immature form
- **carcinoma in situ**, contained at a site without spreading
- **diffuse**, spreading evenly
- **dysplastic**, abnormal in cell appearance
- **epidermoid**, resembling epithelial cells
- **follicular**, containing glandlike sacs
- **hyperchromatic**, intensely colored
- **hyperplastic**, excessive in development (of cells)
- **hypoplastic**, underdeveloped as tissue
- **nodular**, formed in tight cell clusters
- **papillary**, having small papillae projecting from cells
- **pleomorphic**, having many types of cells
- **scirrhous**, made up of hard, densely packed cells
- **undifferentiated**, lacking a defined cell structure

The Cancer Group Institute (www.cancergroup.com) is a commercial site that categorizes types of cancers.

Tumors are also described by their appearance during visual examination. Tumors can be described as:

- **cystic**, filled with fluid
- **fungating**, projecting from a surface in a mushroomlike pattern
- **inflammatory**, having an inflamed appearance (swollen and red)
- **medullary**, large and fleshy
- **necrotic**, containing dead tissue
- **polypoid**, containing polyps
- **ulcerating**, having open wounds
- **verrucous**, having wartlike, irregular growths

Once a tumor is confirmed as malignant, doctor and patient discuss and agree on a **protocol**, a course of treatment. One of the possible treatments is **radiation**, the bombarding of the tumor with rays that damage the DNA of the tumor cells. Most radiation treatment is carefully pinpointed, but some surrounding cells usually suffer damage as well. Radiation can cause many unpleasant side effects, such as hair loss, nausea, and skin damage. Some cancerous tumors will respond to radiation better than others. A *radiosensitive tumor* will absorb the damaging radiation and respond by dying or shrinking. With a *radioresistant tumor*, the radiation has little effect on the growth of the tumor. The use of a drug called a *radiosensitizer* prior to the radiation treatments will increase the radiosensitivity of the tumor. Among the other possible treatments are the use of drugs and surgery.

VOCABULARY REVIEW

In the previous section, you learned terms relating to oncological diagnosis, clinical procedures, and laboratory tests. Before going on to the exercises, review the terms below and refer to the previous section if you have questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. These etymologies (word histories) are for your information only. You do not need to memorize them.

Term	Meaning
alveolar [ăl-VĒ-ō-lăr]	Forming small sacs.
anaplastic [ăn-ă-PLĂS-tĭk] ana-, up + -plastic, forming	Reverting to a more immature form.
carcinoma in situ [kăr-sĭ-NŌ-mă ĭn Sĭ-tū]	Contained at a site without spreading.
cystic [SĪS-tĭk]	Filled with fluid.
diffuse [dĭ-FYŪS]	Spreading evenly.
dysplastic [dĭs-PLĂS-tĭk] dys-, abnormal + -plastic	Abnormal in cell appearance.
epidermoid [ĕp-ĭ-DĒR-mŏyd] epiderm(us) + -oid, like	Resembling epithelial cells.
follicular [fŏl-LĪK-yū-lăr]	Containing glandular sacs.
fungating [FŮNG-ăt-ĭng]	Growing in a mushroomlike pattern.
grade	Level of maturity of a tumor.
hyperchromatic [HĪ-pĕr-krŏ-MĂT-ĭk] hyper-, excessively + chromatic	Intensely colored.
hyperplastic [hĭ-pĕr-PLĂS-tĭk] hyper- + -plastic	Excessive in development (of cells).
hypoplastic [HĪ-pŏ-PLĂS-tĭk] hypo-, abnormally low + -plastic	Underdeveloped, as tissue.
inflammatory [ĭn-FLĂM-ă-tŏr-ē]	Having an inflamed appearance (red and swollen).
medullary [MĒD-ū-lăr-ē]	Large and fleshy.
necrotic [nĕ-KRŌT-ĭk] Greek <i>nekrosis</i> , death	Containing dead tissue.
nodular [NŌD-yū-lăr]	Formed in tight clusters.
papillary [PĂP-ĭ-lăr-ē]	Having papillae projecting from cells.
pleomorphic [plē-ŏ-MŌR-ĭk] pleo-, more + Greek <i>morphe</i> , form	Having many types of cells.
polypoid [PŌL-ĭ-pŏyd] poly(p) + -oid	Containing polyps.
protocol [PRŌ-tŏ-kŏl]	Course of treatment.

Term	Meaning
radiation [RĀ-dē-Ā-shŭn]	Bombarding of tumors with rays that damage the DNA of cells.
scirrhous [SKĪR-ŭs] Greek <i>skirrhos</i> , hard	Hard, densely packed.
stage	Degree of tumor spread.
TNM system	Tumor, node, metastasis system of categorizing tumors.
ulcerating [ŬL-sēr-ā-tĭng]	Having open wounds.
undifferentiated [ŬN-dĭf-ēr-ĔN-shē-ā-tĕd] un-, not + differentiated	Lacking a defined cell structure.
verrucous [vē-RŪ-kōs] Latin <i>verrucosus</i>	Wartlike in appearance.

CASE STUDY

Getting a Diagnosis

Dr. Williams sent Alicia's biopsy to Medical Center Pathologists. He received the following report.

Critical Thinking

61. Does the report cite any unusual growth of cells?
62. Have any of the cells invaded neighboring tissue?

MICROSCOPIC: A single slide containing sections through the submitted material is reviewed. This biopsy of skin is centrally ulcerated. The area of ulceration is surrounded by keratinizing squamous epithelium, which exhibits a full-thickness dysplasia. This dysplastic change is characterized by cells that have a vertical growth pattern, somewhat hyperchromatic nuclei, and an increased mitotic rate. Mitoses do extend to the surface. The lesion does not appear to invade the underlying and associated stroma. Mild-to-moderate dysplastic changes are seen peripherally and do extend to the surgical margins.

DIAGNOSTIC, PROCEDURAL, AND LABORATORY TERMS EXERCISES

Find the Part

Write the body part(s) being tested for cancer by each of the following procedures:

63. mammogram: _____
64. DRE: _____
65. PSA: _____
66. pap smear: _____

Check Your Knowledge

Complete the sentences below by filling in the blanks.

67. A tumor filled with liquid is referred to as _____.
68. Some melanomas are _____, or intensely colored.

69. Chemotherapy is one _____ for treatment of cancer.
70. Tissue that is dead is referred to as _____.
71. Some cancers are _____, or wartlike in appearance.

Pathological Terms

Cancer is a pathological term. It can affect people from the fetal stage until old age. Many advances have been made in cancer prevention and treatment, but some cancers have had no increase in cure rates for many years, and others have increased within the population, which may be due in part to an increase in detection. Table 18-2 lists some common cancers. Figure 18-5 shows one of those cancers (Burkitt's lymphoma).

There are many websites with extensive information about cancer and its potential cures. Visit any of the following sites for information: www.cancer.gov/cancertopics/prevention-genetics-causes/genetics; www.nci.nih.gov/cancertopics/Genetic-Testing-for-Breast-and-Ovarian-Cancer-Risk; and www.cancer.org/docroot/home/index.asp.

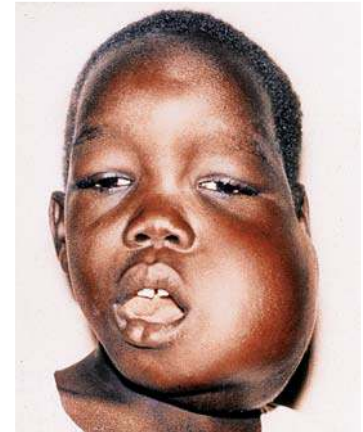


FIGURE 18-5 Burkitt's lymphoma in a child.

TABLE 18-2 Common Cancers

Type of Cancer	Where Cancer Starts	Common Sites in the Body	Specific Risk Groups (most cancers can affect anyone)	Prevention and Early Diagnosis
adenocarcinoma	gland	colon, stomach		high fiber diet; colonoscopy
adenoma	glandular epithelium	pituitary		
astrocytoma	neuroglia	brain		
basal cell carcinoma	skin	skin		avoiding sun exposure; examination of skin
Burkitt's lymphoma (Figure 18-5)	lymph			
carcinoma	epithelial tissue	glands, lungs, kidney, breast		avoidance of carcinogens such as tobacco, asbestos; early checkups
carcinoma in situ	encapsulated tumor	breast, cervix		self-examination; mammography
chondrosarcoma	cartilage			
Ewing's sarcoma	connective tissue			
fibrosarcoma	connective tissue			
glioblastoma	neurological tissue			
glioma	neurological	brain		

(continued)

TABLE 18-2 Common Cancers (cont.)

Type of Cancer	Where Cancer Starts	Common Sites in the Body	Specific Risk Groups (most cancers can affect anyone)	Prevention and Early Diagnosis
Hodgkin's disease	lymph system			
hypernephroma	kidneys			
Kaposi's sarcoma	first seen in skin of AIDS patient, then other organs		patients with HIV	preventative measures (such as safe sex)
leiomyosarcoma	smooth muscle			
leukemia	stem cells			
leukoplakia	tongue or cheeks			
liposarcoma	fat			
lymphoma	lymph system			
medulloblastoma	brain			
melanoma	skin			avoidance of sun; skin examination
nephrosarcoma	kidney			
neuroblastoma	adrenal glands	adrenal glands of infants and children		
non-Hodgkin's lymphoma	lymph tissue			
osteosarcoma	bone			
retinoblastoma	retina	eye		
rhabdomyosarcoma	striated muscle			
sarcoma	connective tissue			

CASE STUDY

Seeing a Specialist

Alicia's cancer is a carcinoma in situ. Dr. Williams refers Alicia to a surgical oncologist who performs the surgery to remove the tumor. The surgeon, Dr. Wilma Grant, examines surrounding tissue during the surgery and decides that Alicia does not need further treatment. The surgeon cautioned Alicia to make sure she has regular six-month checkups.

Critical Thinking

72. Why did the doctor recommend six-month checkups?
73. Dr. Grant did not recommend radiation or chemotherapy. Does that mean that Alicia's cancer has metastasized?

PATHOLOGICAL TERMS EXERCISES

Find the Disease

Using Table 18-2, write at least one type of cancer for each location.

- | | |
|----------------------|-------------------------------|
| 74. breast _____ | 80. lymph system _____ |
| 75. colon _____ | 81. bone _____ |
| 76. kidney _____ | 82. fat _____ |
| 77. skin _____ | 83. neurological tissue _____ |
| 78. brain _____ | 84. neuroglia _____ |
| 79. stem cells _____ | |

Preventing and Detecting Cancers

Answer the following questions.

85. Using Table 18-2 as a guide, write a brief paragraph about how you can minimize the risk of contracting certain cancers.

86. What two types of cancer are detectable by self-examination at an early stage? _____
and _____

Spell It Correctly

For each of the following words, write C if the spelling is correct. If it is not, write the correct spelling.

- | | |
|----------------------|-----------------------|
| 87. aveolar _____ | 90. medulary _____ |
| 88. follicular _____ | 91. pleomorphic _____ |
| 89. displastic _____ | |

Surgical Terms

Many cancers can be diagnosed and treated with surgery. First, however, tissue is usually examined in a *biopsy*, the removal of a small amount of living tissue for diagnosis (under a microscope in most cases). There are many types of biopsies depending on the type of cancer suspected. Some common ones are:

- An **incisional biopsy** is the removal of a part of a tumor for examination.
- An **excisional biopsy** is one in which the tumor is removed and surrounding tissue is examined for spread of the tumor.
- A **brush biopsy** is the passing of a catheter with bristles on it into the ureter or other areas to remove cells for examination.

- A **needle biopsy** is any biopsy in which cells are aspirated through a needle.
- An **exfoliative biopsy** is one in which cells are scraped off of the skin for examination.

If a tumor is found to be malignant, the tumor is usually removed to an established *surgical margin* or to the point where it abuts normal tissue. A localized tumor can be removed in a **lumpectomy** or **tylectomy**. Some surgeries involve **resectioning**, removal of the tumor and a large amount of the surrounding tissue, including lymph nodes; others involve **exenteration**, removal of an organ, tumor, and surrounding tissue. Other surgical procedures are **cryosurgery**, destruction by freezing; **electrocauterization**, destruction by burning; or **fulguration**, destruction by high-frequency electrical current.

VOCABULARY REVIEW

In the previous section, you learned terms relating to surgery. Before going on to the exercises, review the terms below and refer to the previous section if you have questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. These etymologies (word histories) are for your information only. You do not need to memorize them.

Term	Meaning
brush biopsy	The passing of a catheter with bristles into the ureter to gather cells for examination.
cryosurgery [krī-ō-SĔR-jēr-ē] cryo-, cold + surgery	Destruction by freezing.
electrocauterization [ē-LĔK-trō-CĀW-tēr-ī-ZĀ-shŭn] electro-, electrical + cauterization	Destruction by burning tissue.
excisional biopsy [ĕk-SĪZH-shŭn-l BĪ-ōp-sē]	Removal of tumor and surrounding tissue for examination.
exenteration [ĕks-ĕn-tēr-Ā-shŭn] ex-, out of + Greek <i>enteron</i> , bowel	Removal of an organ, tumor, and surrounding tissue.
exfoliative [ĕx-FŌ-lē-ā-tiv] biopsy	The scraping of skin cells from the skin surface for examination.
fulguration [fŭl-gŭ-RĀ-shŭn]	Destruction by high-frequency current.
incisional [ĭn-SĪZH-ŭn-l] biopsy	Removal of a part of a tumor for examination.
lumpectomy [lŭm-PĔK-tō-mē] lump + -ectomy	Surgical removal of a localized tumor.
needle biopsy	Removal of cells for examination by aspirating them with a needle.
resectioning [rē-SĔK-shŭn-ĭng]	Removal of a tumor and a large amount of surrounding tissue.
tylectomy [tī-LĔK-tō-mē] Greek <i>tulos</i> , lump + -ectomy	Surgical removal of a localized tumor.

SURGICAL TERMS EXERCISES

Find a Match

Match the correct term in the right-hand column with its definition in the left-hand column

- | | |
|--|-------------------------|
| 92. ____ removal of part of a tumor for examination | a. fulguration |
| 93. ____ removal of a tumor and surrounding tissue for examination | b. cryosurgery |
| 94. ____ form of surgery using freezing | c. electrocauterization |
| 95. ____ form of surgery using burning | d. incisional biopsy |
| 96. ____ form of surgery using high-frequency current | e. excisional biopsy |

CASE STUDY

Getting Information

Alicia was concerned about the possibility of a recurrence of cancer. She asked Dr. Williams for a copy of the pathologist's report. Alicia did not understand some of the language in it, so she asked Dr. Williams for an explanation.

98. The dysplastic changes extend to the surgical margin, which is the outline out to which the removal of the cancer will take place. What determines the surgical margin?

Critical Thinking

97. How might Dr. Williams explain "The lesion does not appear to invade the underlying and associated . . .?"

Pharmacological Terms

Aside from surgery and radiation, cancer treatment includes three other **modalities** (methods)—**chemotherapy**, use of drugs to treat cancer, **biological therapy**, use of agents that enhance the body's own immune response in fighting tumor growth, and **gene therapy**, the use of cells from a laboratory to change the course of a disease (much of this is still experimental). Both chemotherapy and biological therapy have side effects, such as hair loss, nausea, and so on. Gene therapy is just in its beginning stages and long-term results are not known yet. The other four cancer treatments may be used together or separately during the course of a protocol. There are many researchers working on new cancer therapies, such as the inhibition of *angiogenesis*, the process in the body of supplying blood to tumors.

Radiation and chemotherapy must be specifically directed so as not to harm healthy cells while destroying unhealthy ones. Biological therapy targets cells that are receptive to the substances being injected.

For more information on gene therapy, go to the Human Genome Project Web site (http://www.ornl.gov/sci/techresources/Human_Genome/medicine/genetherapy.shtml).

MORE ABOUT . . .

Angiogenesis Inhibitor Therapy

Angiogenesis is the formation of new blood vessels controlled by chemicals produced in the body. Because tumors cannot grow or spread without the formation of new blood vessels and a blood supply, scientists are trying to find ways to stop angiogenesis. Angiogenesis is not a frequent process in adults, but it does occur in women each month as new vessels form in the lining of the uterus during the menstrual cycle. In addition, angiogenesis is necessary for the regeneration of tissue during wound healing. Unfortunately new blood vessel generation can provide cancer cells with oxygen and nutrients, allowing these cells to grow and spread to other parts of the body.

The objective of angiogenesis inhibitor therapy in cancer treatment is to arrest and/or block the chemicals responsible for beginning the new blood vessel formation process. Some drugs block vascular endothelial cell production directly or by obstructing the endothelial cells' ability to break down the extracellular matrix, allowing cancer cells to migrate. Researchers have answered many questions about angiogenesis, but many questions still remain. Studies continue trying to determine if inhibiting angiogenesis can be a long-term solution to slowing down or preventing the growth and spread of cancer in humans. Currently, new drugs being tested are in clinical trials and a few drugs have been approved by the U.S. Food and Drug Administration (FDA) for use on certain types of cancers.

VOCABULARY REVIEW

In the previous section, you learned terms relating to pharmacology. Before going on to the exercises, review the terms below and refer to the previous section if you have any questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. The etymologies (word histories) are for your information only. You do not need to memorize them.

Term	Meaning
biological therapy	Treatment of cancer with agents from the body that increase immune response.
chemotherapy [KĒM-ō-thār-ă-pē, KĒ-mō-thār-ă-pē] chemo-, chemical + therapy	Treatment of cancer using drugs.
gene therapy	Method of treatment using genetically changed cells to cure or lessen the symptoms of disease.
modality [mō-DĀL-ĭ-tē]	Method of treatment.

CASE STUDY

Finding Another Cancer

Alicia went for a six-month gynecological checkup. Her pap smear was normal. She encouraged her sister, Margo, to see Dr. Williams. Margo is 15 years younger than Alicia. Margo goes to the gynecologist only when she has a problem. She has never had a mammogram. Dr. Williams shows Margo how to do breast self-examination and tells her that he feels a small lump on the side of her breast. This was confirmed with a mammogram and a biopsy. After a lumpectomy, Margo was

told that the cancer had spread to one lymph node, which was also removed. Chemotherapy is recommended, along with biological therapy in the form of a weekly injection.

Critical Thinking

- 99.** Why did the surgeon recommend chemotherapy?
100. How might the biological therapy help Margo?

TERMINOLOGY IN ACTION

A male patient has a blood test. It indicates there is an unusually high PSA level. His doctor recommends a biopsy to see if he has cancer. What type of cancer does the doctor suspect might be present. A female patient has a normal Pap smear. If it had been abnormal, what type of cancer would be suspected? Name the most virulent type of skin cancer. What type of cancer is most often caused by smoking?

USING THE INTERNET

Go to the American Cancer Society's Web site (www.cancer.org) and write a paragraph about cancer prevention. Also, list three types of treatment for cancer discussed at that site.

CHAPTER REVIEW

The material that follows is to help you review this chapter.

Complete the Sentence

Circle the term that best describes the *italicized* description of the correct answer.

101. The patient was treated with *a bombarding of tumors with rays that damage the DNA of cells* and had positive result after the treatment was completed. (chemotherapy, protocol, radiation)
102. The physician remarked that the lesion appeared *to be formed in tight clusters* and was found to be abnormal. (necrotic, nodular, verrucous)
103. A biopsy revealed that the tumor was *hard and densely packed* just as the pathologist suspected. (scirrhous, papillary, pleomorphic)
104. Dr. Jacobs noted that the dysplastic lesion appeared *intensely colored* and this concern warranted further evaluation. (hyperplastic, hypoplastic, hyperchromatic)
105. One of the purposes of the TNM system of categorizing tumors is to determine *the degree of tumor spread* within the body. (carcinoma in situ, stage, grade)

Root Out the Meaning

Separate the following terms into word parts and define each word as well as each word part.

- | | |
|---------------------------|--------------------------------|
| 106. carcinogenic _____ | 126. radiologist _____ |
| 107. carcinolytic _____ | 127. radiometer _____ |
| 108. carcinoma _____ | 128. radiopaque _____ |
| 109. carcinophobia _____ | 129. radiopathology _____ |
| 110. mutagen _____ | 130. radioresistant _____ |
| 111. oncogenesis _____ | 131. radiopharmaceutical _____ |
| 112. oncogenic _____ | 132. radiosensitive _____ |
| 113. oncogenous _____ | 133. radiotoxiemia _____ |
| 114. oncofetal _____ | 134. genoblast _____ |
| 115. oncology _____ | 135. glioblastoma _____ |
| 116. oncolysis _____ | 136. glioma _____ |
| 117. oncosis _____ | 137. fibrosarcoma _____ |
| 118. radioactive _____ | 138. medulloblastoma _____ |
| 119. radiodiagnosis _____ | 139. melanoma _____ |
| 120. radiograph _____ | 140. nephrosarcoma _____ |
| 121. radiographer _____ | 141. neuroblastoma _____ |
| 122. radiographic _____ | 142. osteosarcoma _____ |
| 123. radiogram _____ | 143. retinoblastoma _____ |
| 124. radiography _____ | 144. rhabdomyosarcoma _____ |
| 125. radiology _____ | 145. sarcoma _____ |

Complete the Sentence

Circle the term that best describes the *italicized* description of the correct answer.

146. Timothy Clemons' physician indicated that the skin cancer on his forehead would be removed by *fulguration*. (destruction by burning tissue, destruction by freezing tissue, destruction by high-frequency current)
147. Karen Smartley has to make a decision about how her breast tumor will be removed before she has surgery. Her physician is recommending the *surgical removal of a localized tumor*. (resectioning, excisional biopsy, lumpectomy)
148. The tumor was found to be *growing uncontrollably* through out the body. (encapsulating, metastasizing, mutating)
149. The medical term for *abnormal tissue growth* is _____. (anaplasia, apoptosis, dysplasia)

Check Your Spelling

For each of the following terms, place a C if the spelling is correct. If it is not, write the correct spelling in the space provided.

- | | |
|--------------------------|-----------------------------|
| 150. chondocarcoma _____ | 153. rabbdomyosarcoma _____ |
| 151. milanocytoma _____ | 154. neuroblastoma _____ |
| 152. astrocytoma _____ | 155. inflamatory _____ |

DEFINITIONS

Define the following terms, combining forms and suffixes. Review the chapter before starting. Make sure you know how to pronounce each term as you define it.

TERM

- | | | |
|--|---|---|
| 156. alveolar [äl-VĒ-ō-lär] | 170. cytoplasm [SĪ-tō-plāzm] | 181. exfoliative [ěks-FŌ-lē-ā-tīv] biopsy |
| 157. anaplasia [än-ă-PLĀ-zhē-ă] | 171. dedifferentiated [dē-DĪF-ēr-ēn-shē-Ā-těd] | 182. follicular [fōl-LĪK-yū-lär] |
| 158. anaplastic [än-ă-PLĀS-tōk] | 172. differentiated [dĭf-ēr-ĒN-shē-ā-těd] | 183. fulguration [fŭl-gū-RĀ-shŭn] |
| 159. apoptosis [ă-pōp-TŌ-sis] | 173. diffuse [dĭ-FYŪS] | 184. fungating [FŮNG-āt-ĭng] |
| 160. benign [bĕ-NĪN] | 174. dysplasia [dĭs-PLĀ-zhē-ă] | 185. gene therapy |
| 161. biological therapy | 175. dysplastic [dĭs-PLĀS-tĭk] | 186. grade |
| 162. blast(o) | 176. electrocauterization [ē-LĚK-trō-CĀW-tēr-ĭ-ZĀ-shŭn] | 187. heteroplasia [HĚT-ēr-ō-PLĀ-zē-ă] |
| 163. -blast | 177. encapsulated [ĕn-KĀP-sū-lā-těd] | 188. hyperchromatic [HĪ-pēr-krō-MĀT-ĭk] |
| 164. brush biopsy | 178. epidermoid [ĕp-ĭ-DĚR-mōyd] | 189. hyperplastic [hĭ-pēr-PLĀS-tĭk] |
| 165. carcin(o) | 179. excisional biopsy [ĕk-SĪZH-shŭn-l BĪ-ōp-sē] | 190. hypoplastic [HĪ-pō-PLĀS-tĭk] |
| 166. carcinoma in situ [kār-sĭ-NŌ-mă ĭn SĪ-tū] | 180. exenteration [ĕks-ĕn-tēr-Ā-shŭn] | 191. incisional [ĭn-SĪZH-ŭn-l] biopsy |
| 167. chemotherapy [KĚM-ō-thār-ă-pē, KĚ-mō-thār-ă-pē] | | |
| 168. cryosurgery [krĭ-ō-SĚR-jēr-ē] | | |
| 169. cystic [SĪS-tĭk] | | |

TERM

- | | | |
|--|----------------------------------|---|
| 192. inflammatory
[ĭn-FLĂM-ă-tōr-ē] | 205. neoplasm [NĒ-ō-plăzm] | 219. resectioning
[rē-SĔK-shŭn-ĭng] |
| 193. invasive [ĭn-VĂ-sĭv] | 206. nodular [NŌD-yŭ-lăr] | 220. sarcoma [săr-KŌ-mă] |
| 194. lumpectomy
[lŭm-PĔK-tō-mē] | 207. -oma (plural -omata) | 221. scirrhous [SKĪR-ŭs] |
| 195. malignant [mă-LĪG-nănt] | 208. onc(o) | 222. solid tumor |
| 196. medullary [MĔD-ŭ-lăr-ē] | 209. oncogene [ŌNG-kō-jĕn] | 223. stage |
| 197. metastasis [mĕ-TĂS-tă-sĭs] | 210. papillary [PĂP-ĭ-lăr-ē] | 224. teratoma [tĕr-ă-TŌ-mă] |
| 198. mitosis [mĭ-TŌ-sĭs] | 211. -plasia | 225. TNM system |
| 199. modality [mō-DĂL-ĭ-tē] | 212. -plasm | 226. tumor [TŪ-mŏr] |
| 200. muta | 213. -plastic | 227. tylectomy [tĭ-LĔK-tō-mē] |
| 201. mutagen(o) | 214. pleomorphic [plē-ō-MŌR-fĭk] | 228. ulcerating [ŬL-sĕr-ă-tĭng] |
| 202. mutation [myŭ-TĂ-shŭn] | 215. polypoid [PŌL-ĭ-pŏyd] | 229. undifferentiated
[ŬN-dĭf-ĕr-ĔN-shĕ-ă-tĕd] |
| 203. necrotic [nĕ-KRŌT-ĭk] | 216. protocol [PRŌ-tō-kŏl] | 230. verrucous [vĕ-RŪ-kŏs] |
| 204. needle biopsy | 217. radi(o) | |
| | 218. radiation [RĂ-dē-Ă-shŭn] | |

Abbreviations

Write the full meaning of each abbreviation.

ABBREVIATION

- | | | |
|------------|-----------------|---------------------|
| 231. ALL | 238. CML | 245. PSA |
| 232. AML | 239. DES | 246. rad |
| 233. bx | 240. DNA | 247. RNA |
| 234. CA | 241. DRE | 248. RT |
| 235. CEA | 242. ER | 249. TNM |
| 236. chemo | 243. METS, mets | 250. T _x |
| 237. CLL | 244. NHL | 251. XRT |

Name _____ Date _____

Chapter 18: Word- Building (20 questions—1 pts. each)

Using the following combining forms and suffixes, complete the word that best fits the definition of each word relating to terms in oncology listed below. Combining forms may be used more than once.

-blast	mutagen(o)	-plasm
blast(o)	-oma	-plastic
carcin(o)	onc(o)	radi(o)
muta	-plasia	

1. Cancer-causing: _____ genic
2. Agent that promotes change: _____ gen
3. Tumor of immature cells: _____ oma
4. Abnormal tissue development: dys _____
5. Study of and treatment with radiation: _____ logy
6. Slowing the progression of a cancer: _____ static
7. Destructive of cancer cells: _____ lytic
8. Radiation sickness: _____ toxemia
9. Immature nerve cell: neuro _____
10. Tumor cell: _____ cyte
11. Radiation treatment: _____ therapy
12. Cell substance: cyto _____
13. Abnormal new tissue growth: _____ neo
14. Undifferentiated cell: _____ cyte
15. Device for measuring power of x-rays: _____ meter
16. Destructive of a cancer tumor: _____ lytic
17. Marked by abnormal tumor development: dys _____
18. Production of embryonic cells: _____ genesis
19. Diagnosis using x-rays: _____ diagnosis
20. Treatment of tumors: _____ therapy