Section 1 Cancer Terminology

OBJECTIVES:

Upon completing this section, you should be able to:

1. Define the following terms: cancer, tumor, anaplasia, hyperplasia, dysplasia, differentiation, metastasis, and micrometastases.

2. Explain the difference between a benign and malignant tumor.

3. Briefly describe the stem cell theory of cell growth and differentiation.
The study of cancer will begin by defining several terms necessary to the understanding of the topic.

**Cancer**

Surprisingly, there are many definitions of the word cancer, but none is universally accepted. Any definition must embody two characteristics: the property of uncontrollable growth of cells originating from normal tissue, and the property of killing the host by means of local tissue invasion and/or distant spread (metastasis). Some have defined cancer as autonomous growth that is unresponsive to normal growth-regulatory factors. Others have emphasized the irreversibility with which cancer cells lose the differentiated characteristics and physiologic functions of the mature tissue of origin. Still others have emphasized the gross or microscopic anatomy of tumors, or the growth and antigenic properties that they share with fetal cells. A good working definition is that cancer is a group of diseases characterized by uncontrolled cellular growth with local tissue invasion and/or systemic metastasis. In the subsequent pages, we will take a closer look at the properties of cancer cells.

**Anaplasia, Dysplasia, and Hyperplasia**

Anaplasia, dysplasia, and hyperplasia are three words commonly used in reference to malignancies. The suffix *plasia* means “formation.” The prefixes “ana,” “dys,” and “hyper” give these words their unique meanings.

*Anaplasia* is the loss of structural organization and useful function of a cell. Generally, cancer cells resemble undifferentiated or primitive cells that have not developed the specialized cell structure typical of their tissue of origin. In other words, instead of developing into nerve cells or muscle cells, they remain in an undifferentiated, primitive state. The degree of anaplasia varies; sometimes the tumors are so undifferentiated, it is literally impossible to determine the tissue of origin.

*Dysplasia* is a disturbance in the size, shape, and organization of cells and tissues. Dysplasia is abnormal—but not yet cancerous—tissue development. The epidermis and mucosal surfaces (linings of the mouth, nose, intestine, cervix) that normally and constantly undergo cellular multiplication, differentiation, organization, and death are common sites of dysplasia. Dysplasia also is common in chronic inflammatory and proliferative lesions, and it is recognized as part of a developmental phase of many neoplasms.

*Hyperplasia* is an increase in the number of cells in a tissue or organ causing an increase in the bulk of an organ. It should not be confused with hypertrophy, which is an increase in the size of the constituent cell. Nor is hyperplasia a synonym for tumor growth. Hyperplasia is induced by known stimuli and is a controlled process; inasmuch as it stops when the stimulus has ceased. In addition, hyperplasia may serve a useful purpose, such as preparing breast tissue for lactation or reconstituting the liver with structurally normal cells after partial hepatectomy. Tumor growth obeys none of these rules or purposes. However, cancerous changes may eventually occur in hyperplastic tissue.

Because hyperplasia and dysplasia often precede the development of many tumors by months or even years, recognition and proper treatment at this early stage in the development process may help to prevent malignancies. For example, the Papanicolaou Smear (or Pap Smear) permits differentiation among normal, dysplastic, or cancerous cells, a technique that allows early detection of cervical cancer. The Pap Smear has greatly reduced the morbidity and mortality of cervical cancer.

**Defining, Naming, and Classifying Tumors**

The word *tumor* is derived from the Latin word *tumere*, meaning “to swell.” At one time, the word was used to indicate any type of swelling (traumatic, inflammatory, neoplastic). Today, its meaning often is used synonymously with the term “neoplasm.” Composed of two terms, *neo* (new) and *plasma* (formation), the word neoplasm refers
to an abnormal growth of tissue whose cells usually have rapid growth. \textit{Neoplasia} is the pathologic process that results in the formation and growth of a neoplasm (tumor). A tumor can be either \textit{benign} or \textit{malignant}.

\textbf{Benign Tumors}

The word \textit{benign} means nonmalignant and suggests that such tumors are harmless. In many cases, this is true. But a benign tumor can lead to death if it grows in a critical area of the body, such as the brain. Also, over a period of time, some benign tumors do become malignant.

Let’s review distinguishing features of benign tumors.

\textit{First}, a benign tumor usually is encapsulated by a well-defined fibrous cover (like the skin of an orange) separating the mass from surrounding tissue.

\textit{Second}, a benign tumor neither invades surrounding tissue nor metastasizes (spreads via the blood and lymphatic systems), but remains within the site of origin.

\textit{Third}, benign tumor cells exhibit a lesser degree of anaplasia (loss of structural organization and useful function) than do cells of a malignant tumor. Therefore, benign tumor cells resemble normal cells; they are said to be typical of the cells or tissues of origin.

\textit{Fourth}, benign tumors usually grow slowly. (This is a generalization; some malignant tumors, such as breast cancers, also grow slowly, while some benign tumors, such as leiomyomas, grow rapidly.)

\textit{Fifth}, benign tumors do not progress in a uniform manner. Their growth may be slow, stationary, or they may even regress.

Finally, recurrence is rare after simple surgical removal.

Thus benign tumors generally are less dangerous to the patient than malignant tumors.

Most benign tumors are named by adding the suffix \textit{oma} to the cell composing the tumor. For example, a benign tumor composed of fibrocytes (connective tissue cells) is called a \textit{fibroma}; one composed of lipid (fat) cells, is called a \textit{lipoma}. All benign tumors arising from muscle or connective tissue cells, such as bones, cartilage, and tendons, are named this way.

\textit{Benign epithelial tumors} also are named by adding the suffix \textit{oma} to a base word, but, in this case, some are named according to cells of origin, while others are named according to their microscopic or macroscopic appearance.

An example of a name based on the cell of origin is \textit{adenoma}. The prefix \textit{adeno} is from the Greek word \textit{adenos}, meaning “gland.” Benign epithelial tumors that either arise from cells that form glandular patterns or develop from glands, but do not necessarily form glandular patterns, are called \textit{adenomas}.

Other benign epithelial tumors sometimes are named according to microscopic or macroscopic appearance. Macroscopically, for instance, an epithelial tumor forming a large cystic mass, such as found in the ovary, is referred to as a \textit{cystoma}, or a \textit{cystadenoma}. One having microscopic or macroscopic finger-like projections is called a \textit{papilloma} (papilla = nipple-shaped projection).

\textbf{Malignant Tumors}

The word \textit{malignant} means to have the property of local invasion and destructive growth and metastasis, and is derived from a Latin term meaning “wicked.” The distinguishing features of malignant tumors make it clear why this type of tumor was so named.

\textit{First}, malignant tumors usually infiltrate or invade surrounding tissue. This peculiar characteristic may be why the term \textit{cancer} (meaning “crab”) was chosen, because certain types of breast cancer resemble a crab with claw-like processes extending deep into breast tissue. Cancers almost never are encapsulated. Although an occasional, slowly expanding malignant tumor may appear to develop an enclosing fibrous membrane, histologic examination may reveal tiny crab-like penetrations through such encapsulation.
Second, malignant tumors frequently metastasize, which refers to the spread of primary tumor cells to distant body sites, generally via the lymphatic system and bloodstream. Table 2 summarizes some common sites of metastasis from specific primary tumors.

Third, malignant tumor cells usually are atypical of the cells of their tissue of origin and have a greater degree of anaplasia than those of a benign tumor. Because some similarities usually remain, the cell of origin can generally be determined.

Fourth, malignant cells exhibit a unique trait called autonomy. Autonomy is the ability of tumor cells to grow in an essentially unrestrained manner in the host. In other words, malignant cells ignore the normal rule of cell reproduction—they function outside the limits of growth of normal cells and are not responsive to normal controls on cell numbers.

Fifth, with malignant tumors, unlike benign tumors, recurrence is more common after surgical removal because cells have invaded surrounding tissue or have metastasized and are not removed or destroyed by treatment. Such local invasion and metastasis may be microscopic and not detected at the time of treatment.

Sixth, cancer cells are genetically unstable and contain or later develop abnormal numbers of chromosomes. Since chromosomes contain the genes that transmit hereditary characteristics, this instability explains the unusual and constantly changing characteristics of the cancer cell.

### Table 2.
Common Sites of Metastasis From Primary Tumors

<table>
<thead>
<tr>
<th>Primary Tumor</th>
<th>Sites of Metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and neck</td>
<td>Lymph nodes</td>
</tr>
<tr>
<td></td>
<td>Lung</td>
</tr>
<tr>
<td>Colon, pancreas, stomach</td>
<td>Liver</td>
</tr>
<tr>
<td></td>
<td>Lung</td>
</tr>
<tr>
<td></td>
<td>Lymph nodes</td>
</tr>
<tr>
<td>Ovary</td>
<td>Intraperitoneal</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>Lymph nodes</td>
</tr>
<tr>
<td></td>
<td>Lung</td>
</tr>
<tr>
<td></td>
<td>Bone</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
</tr>
<tr>
<td></td>
<td>Skin</td>
</tr>
<tr>
<td></td>
<td>Chest wall</td>
</tr>
<tr>
<td>Lung cancer (bronchogenic carcinoma)</td>
<td>Brain</td>
</tr>
<tr>
<td></td>
<td>Liver</td>
</tr>
<tr>
<td></td>
<td>Lymph nodes</td>
</tr>
<tr>
<td></td>
<td>Bone</td>
</tr>
<tr>
<td>Bone, kidney, uterus, testicle</td>
<td>Lung</td>
</tr>
<tr>
<td>Prostate</td>
<td>Bone</td>
</tr>
<tr>
<td>Melanoma</td>
<td>Liver</td>
</tr>
<tr>
<td></td>
<td>Brain</td>
</tr>
<tr>
<td></td>
<td>Lung</td>
</tr>
</tbody>
</table>
In summary, a *malignant tumor* invades surrounding tissues, usually produces metastases, is likely to recur after attempted removal, and in most cases causes death unless adequately treated.

In comparing benign and malignant tumors, a good example is that of neurofibromatosis, or von Recklinghausen’s disease (the Elephant Man’s disease). The characteristic feature of this benign proliferative disease is the occurrence of “neurofibromas,” representing benign growth of special fibroblasts or Schwann cells. These tumors, because of their association with nerves, may cause a variety of nerve deficits, including cranial nerve palsy and spinal cord injury, but they do not invade adjacent tissue or metastasize. On occasion, however, they undergo malignant transformation to sarcomas, which have all the characteristics of malignancy, including invasion and metastasis. In this particular example, death may result either from pressure at a critical point by a benign tumor or transformation of a benign tumor into a malignant tumor. Table 3 provides a summary of the differences between benign and malignant tumors.

Malignant tumors fall into one of two broad classes, according to tissue of origin. Those malignant lesions originating from epithelial tissue are called *carcinomas*. Those originating from *connective* and *muscle* tissue are called *sarcomas*. Thus, when one sees the word carcinoma, it is immediately clear that the cancer arose from cells of tissue covering some body surface—the urinary bladder, uterus, intestinal tract, respiratory tract, etc. Similarly, sarcomas arise from some type of mesenchymal (connective) tissues, such as osteogenic sarcoma, which develops in the long bones.

In many cases, the names of malignant tumors give a rather precise designation. For example, all carcinomas originating in the lung parenchyma and bronchial tubes are called lung cancer or bronchogenic carcinoma. There are different types of lung cancer, however, with the name of each type giving a rather concise description.

Among the various types of bronchogenic carcinoma are bronchogenic squamous cell carcinomas, bronchogenic small cell anaplastic carcinomas, bronchogenic adenocarcinomas, and bronchogenic

---

**Table 3. Differences Between Benign and Malignant Tumors**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Benign Tumor</th>
<th>Malignant Tumor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure and</td>
<td>Typical of tissue origin</td>
<td>Atypical of tissue origin</td>
</tr>
<tr>
<td>differentiation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of growth</td>
<td>Usually slow</td>
<td>May be slow, rapid, very rapid</td>
</tr>
<tr>
<td>Progression</td>
<td>Slowly progressive (may remain</td>
<td>Usually progressive, almost always fatal if untreated</td>
</tr>
<tr>
<td></td>
<td>stationary; may regress)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>rarely fatal if treated</td>
<td></td>
</tr>
<tr>
<td>Mode of growth</td>
<td>Expansion with capsule</td>
<td>Local infiltration and/or metastasis to distant sites</td>
</tr>
<tr>
<td>Tissue destruction</td>
<td>None</td>
<td>Common, ulceration and necrosis</td>
</tr>
<tr>
<td>Recurrence</td>
<td>Rare</td>
<td>Common</td>
</tr>
<tr>
<td>Prognosis</td>
<td>Fatal only if surgically</td>
<td>Fatal if uncontrolled (untreated)</td>
</tr>
<tr>
<td></td>
<td>inaccessible</td>
<td></td>
</tr>
</tbody>
</table>
large cell carcinomas. In each case, the name tells us that all of the above neoplasms occur in the lungs, with the cell name giving a more precise histopathologic designation.

**Simple, Mixed, and Compound Tumors**

Malignant tumors may be classified as being *simple*, *mixed*, or *compound*.

*Simple* neoplasms are those with proliferating (dividing) cells that closely resemble one another. For example, proliferating cells of squamous cell carcinoma basically resemble those of stratified squamous epithelium. Most common cancers fall into this category.

*Mixed* and *compound tumors* are different from simple tumors. Before explaining them, we need to know the meaning of germ layers, because these tumors are composed of cells from the germ layers. You often will hear oncologists speak of germ cells in relation to malignancies, such as ovarian and testicular carcinomas.

The embryo is composed of three layers of tissue called *germ layers*. These are basic tissues from which all other body tissues are formed. The three germ layers are: 1) the ectoderm, 2) the mesoderm, and 3) the endoderm.

The *ectoderm* or outer germ layer is the tissue from which skin cells, hair follicle cells, sweat gland cells, and cells of the nervous system are derived. The *mesoderm* or middle germ layer gives rise to muscle cells, bone cells, fascia, and connective tissue cells. The *endoderm* or inner germ layer is the tissue from which the mucosa of the genitourinary tract, the gastrointestinal tract, and the respiratory tract are formed.

*Mixed neoplasms* are tumors composed of more than one cell type, with the different cells usually being *derived from a single germ layer*. An example is the mixed tumor of the salivary gland originating in the endoderm. *Compound neoplasms* are tumors containing a variety of cell types, with the cell types originating from *more than one germ layer*. An example would be a teratoma, also referred to as a *teratomatous* neoplasm, because well-differentiated tissue found in these tumors may contain several different types of tissue, such as bone, teeth, muscle—all arising from the mesoderm—and hair, skin, or other cells from the ectoderm. In fact, tissue from any body structure may be present. It is interesting that the word *teratoma* derives from *teras*, the Greek term for monster.

**Cell Differentiation and the Stem Cell Theory**

A human life begins as a single cell—a fertilized egg or ovum. This cell divides into two cells, these into four, then eight, and so on. There are sequential triggering mechanisms that cause cells to begin to specialize, ie, develop new structures and begin functioning in different ways. Thus, some become nerve cells, and some become skin cells, and so on. The process by which normal cells develop special structures and functions is called *differentiation*.

The *stem cell theory* was developed to explain this complex differentiation process. According to the stem cell theory, early in embryonic development, certain cells become destined to produce certain types of tissue, eg, blood, hair, muscle, etc. These predecessors of different tissue types are called “parent” cells or stem cells for that type of tissue.

The stem cell may be thought of as a relatively uncommitted (undifferentiated) cell; various developmental options are open. This is best exemplified by the pluripotent (multilineage) stem cell found in the bone marrow. Pluripotent hematopoietic stem cells are few in number and are capable of self-renewal and of developing into committed progenitor (or precursor) cells of a specialized cell type, such as the granulocyte. These committed cells no longer have the capacity of self-renewal, but are destined to develop along a particular pathway of differentiation, giving rise to only one kind of cell: erythrocyte or megakaryocyte, or monocyte or granulocyte. Various types of blood cells develop from hematopoietic stem cells, and this will be discussed further in Section 8. Since some stem cells remain in the stem cell pool, there is a constant source of cells that give rise to committed
cells. In a similar manner, each organ or tissue, such as the liver, kidney, heart, muscle, and so on, is developed from its own population of stem cells, but these are usually active only in embryonic development.

The rate of division of bone marrow stem cells is carefully regulated by complex mechanisms, not yet fully understood, so that just the proper number of cells are produced. A number of different stimuli, such as increased cell loss (as in hemorrhage), increased cell demand (as in infection), or tissue injury (such as a laceration) may activate stem cells to enter the cell cycle and divide so as to replace the lost or damaged cells.

The stem cell model proposes that tumors arise from carcinogenic (cancer causing) events occurring in the stem cells of a particular tissue. It is believed that the changes associated with the carcinogenic insult produce a defect in the control of normal stem cell function, such as self-renewal, differentiation, and proliferation. In other words, the normal quality control for cell function and growth is lost.

The stem cell model also has major implications for the treatment of the human cancers. If cure or long-term control is the aim of treatment, then therapy must be directed toward the stem cell responsible for tumor regeneration. If one believes that the stem cell represents only a small subpopulation of the total tumor mass, then short-term changes in overall tumor volume may not reflect the true effect of a treatment on the stem cell.

**Tumor Staging**

Anatomic tumor staging is performed to determine “extent of disease.” It is related to the size of the primary tumor mass, extent of local spread, nodal involvement, and the systemic spread (metastasis) of disease. The TNM classification system is commonly used to stage many cancers. The system is such that T = primary tumor size and/or extent of invasion, N = nodal involvement, and M = presence or absence of metastases. Table 4 shows a simplified depiction of the TNM classification for breast cancer.

**Table 4.**

<table>
<thead>
<tr>
<th>Tumor Size (T)</th>
<th>Nodal Involvement (N)</th>
<th>Metastasis (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tis in situ</td>
<td>NO No nodal metastases</td>
<td>MO No distant metastasis</td>
</tr>
<tr>
<td>T1 &lt; 2 cm</td>
<td>N1 Movable axillary nodes</td>
<td>M1 Distant metastasis</td>
</tr>
<tr>
<td>T2 2–5 cm</td>
<td>N2 Fixed axillary nodes</td>
<td></td>
</tr>
<tr>
<td>T3 &gt; 5 cm</td>
<td>N3 Internal mammary nodes</td>
<td></td>
</tr>
<tr>
<td>T4 Extension to chest wall</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These TNM categories are combined to give the stage (eg, Stage I = T1 NO MO; Stage II = T2 NO MO or T1 N1 MO). Numerous subclassifications and variations exist with the TNM system.
SUMMARY

In this section, we discussed terms essential to your understanding of cancer and cancer therapy. The definitions of these terms are summarized below.

Anaplasia is the loss of structural organization and useful function of a cell.

Cancer is a group of diseases characterized by uncontrolled cellular growth, with local tissue invasion, and/or systemic metastasis.

Differentiation means the development of a specialized cellular shape, character, or function.

Dysplasia refers to a disturbance in the usual orderly organization of cells and tissues.

Hyperplasia is an increase in the number of cells in a tissue or organ.

A metastasis is a spread of cells from a primary tumor via the lymphatic and circulatory systems to a distant body part, where such cells give rise to another cancer. Metastases is the plural of metastasis.

A micrometastasis is metastasis too small to be detected by conventional diagnostic methods.

Tumor is an abnormal growth that can be either benign or malignant. A benign tumor is nonmalignant, does not form metastases, and does not invade or destroy adjacent normal tissue.

Most benign tumors are named by adding the suffix “oma” to the name of the cell of origin. Some benign epithelial tumors are also named according to their appearance. A malignant tumor is one that invades surrounding tissues, usually produces metastasis, tends to recur after attempted removal, and usually causes death unless adequately treated.

The names of malignant tumors also have the suffix “oma.” Carcinomas arise from epithelial tissue. Sarcomas arise from connective and muscular tissue.

The stem cell theory states that all tissue subtypes develop from pluripotent stem cells. Some cells remain stem cells; others progress to a specialized (differentiated) state.

Staging is a process to determine the extent of disease, and is related to the size of the primary mass, nodal involvement, and systemic spread.
EVALUATION FRAMES

1. Define the following terms:
   a) cancer: ____________________________
   b) tumor: ____________________________
   c) anaplasia: ____________________________
   d) hyperplasia: ____________________________
   e) dysplasia: ____________________________
   f) differentiation: ____________________________
   g) metastasis: ____________________________
   h) micrometastasis: ____________________________

2. Explain the difference between a benign and malignant tumor._______________________________

3. Describe how benign tumors are named._______________________________

4. Describe how malignant tumors are named._______________________________

5. Name the three germ layers found in the embryo and tell whether each is the inner, middle, or outer layer, i.e., its location.

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td></td>
</tr>
</tbody>
</table>

6. List the specific types of cells originating from each germ layer.

<table>
<thead>
<tr>
<th>Germ Layer</th>
<th>Cell Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td></td>
</tr>
</tbody>
</table>

7. Name and briefly describe the three categories of tumors.

a) ____________________________

b) ____________________________

c) ____________________________

8. Briefly describe the stem cell theory._______________________________
ANSWERS

1. a) cancer: a group of diseases characterized by uncontrolled cellular growth, with local tissue invasion and/or systemic metastasis.
   b) tumor: an abnormal growth of tissue that can be either benign or malignant.
   c) anaplasia: the loss of structural organization and useful function of a cell.
   d) hyperplasia: increase in the number of cells in a tissue or organ.
   e) dysplasia: disturbance in the size, shape, and organization of cells and tissues.
   f) differentiation: to develop a specialized cellular shape, character, or function that differs from that of other cells or tissues.
   g) metastasis: a spread of cells from a primary tumor via the lymphatic system or venous system to distant body parts where such cells give rise to another tumor.
   h) micrometastasis: a metastasis too small to be detected by conventional diagnostic methods.

2. A benign tumor is one that does not invade or destroy adjacent normal tissue. A malignant tumor is one that invades surrounding tissues, usually produces metastases, is likely to recur after attempted removal, and usually causes death unless adequately treated.

3. Some benign tumors are named by stating the cell of origin and adding the suffix oma. Other benign tumors are named according to their appearance.

4. Malignant tumors originating in epithelial tissue are called carcinomas, while those arising in connective and muscular tissue are called sarcomas. The name of the cell of origin may be attached to the suffixes “sarcoma” and “carcinoma.”

5. Name          Location
                endoderm          inner layer
                mesoderm          middle layer
                ectoderm          outer layer

6. Germ Layer          Cell Types
                ectoderm          skin cells, hair follicle cells, sweat gland cells, cells of nervous system
                mesoderm          muscle cells, bone cells, fascia, connective tissue cells
                endoderm          cells of mucous membrane lining genitourinary tract, gastrointestinal tract, and respiratory tract

7. a) Simple neoplasms are tumors composed of closely related dividing (proliferating) cells.
   b) Mixed neoplasms are tumors of more than one cell type, with the cells originating from one germ layer.
   c) Compound neoplasms are tumors containing a variety of cell types with the cells originating in more than one germ layer.

8. The stem cell theory states that all animal cells develop from parent cells called stem cells. Some cells remain stem cells, while others develop into specialized (differentiated) states.

   If you completely understood the preceding material, proceed to Section 2. Otherwise, continue with the reinforcement frames on the next page.
In this section we have dealt with terminology related to cancer. The first term was cancer, which is defined in this program as a group of diseases characterized by uncontrolled cellular growth, with local tissue invasion and/or systemic metastasis. The descriptive verb for this spread is to metastasize.

A general word to describe a growth that can be either benign or malignant is a tumor.

The spread of cells from a primary tumor via either the lymphatic system or venous system to distant body parts where such cells give rise to another cancer is called metastasis.

One of the distinguishing features of a benign tumor is that it neither invades surrounding tissue nor does it metastasize.

A benign growth is one that does not metastasize and does not invade surrounding tissue. In contrast, a tumor is one that invades surrounding tissue, usually produces metastases, is likely to recur after attempted removal, and causes death unless adequately treated.

As you can see, a tumor can be either benign or malignant. Cancer is always a malignant tumor.

From the choices below, select those characteristic of cancer.

- a) does not form metastases
- b) forms metastases
- c) does not invade surrounding tissues
- d) invades surrounding tissues
- e) usually recurs after attempted removal
- f) usually does not recur after attempted removal

The loss of structural organization and useful function of a cell is called anaplasia.

Malignant tumors have a greater degree of anaplasia than do benign tumors.

Another term in this section is hyperplasia. While the loss of structural organization and useful function of a cell is called anaplasia, an increase in the number of cells in a tissue or organ is called hyperplasia.

Hyperplasia is defined as an increase in the number of cells in a tissue or organ.

In naming tumors we learned that most benign tumors are named according to the cell/organ of origin by adding the suffix “oma.” For example, a benign tumor composed of fat cells is called a lipoma.
1.13 In fact, all benign tumors arising from muscle tissue cells and connective tissue cells are named by adding the suffix ........................ to the cell of .................................................

oma origin

1.14 Like benign muscle and connective tissue tumors, benign epithelial tumors are named by adding the suffix ........... to a base word. However, in the case of.................. tumors, some growths are named according to the...... of...........while others are named according to (size/appearance/structure) ..........................

oma epithelial cell origin appearance

1.15 For example, the prefix adeno is the Greek word for gland. Both benign and malignant tumors forming glandular patterns or arising from those glands without forming glandular patterns are prefixed with the word adeno. Thus, benign epithelial tumors arising from cells that form .............. patterns and those developing from glands are termed..............

glandular adenomas

1.16 However, some benign epithelial tumors are named according to appearance. For instance, epithelial tumors having finger-like projections or papillae whether microscopically or macroscopically are called (papillomas/papillocarcinomas/papillosarcomas) ...................

papillomas (carcinomas and sarcomas are malignant tumors)

1.17 Malignant tumors also are named by adding the suffix ....................... to the base word.

oma

1.18 As we have learned, there are (three/two) ................. broad classifications for malignant tumors.

two

1.19 Those two broad classifications are carcinomas and sarcomas. Tumors originating in epithelial tissue are called carcinomas. Those originating in connective and muscle tissues are called ................................................

sarcomas

1.20 Malignant tumors arising from epithelial tissues are called......................... Those arising from connective and muscle tissues are called ................................................

carcinomas sarcomas

1.21 Carcinomas and sarcomas are further distinguished by adding the name of the cell from which the tumor arises. For example, a malignant epithelial tumor with a glandular growth pattern is called an .......................-carcinoma.

adeno

1.22 A malignant connective tissue tumor arising from lymphocytes is a...................... One arising from smooth muscle is a ..............

lymphosarcoma leiomyosarcoma

1.23 Sometimes a tumor is identified by a descriptive phrase such as squamous cell carcinoma. Squamous cells are found throughout the body lining cavities and canals, so the location of a ................... cell tumor must be pinpointed.

squamous

1.24 This is done by adding the name of the organ of origin to the name. For instance, a squamous cell tumor originating in a bronchial tube or the lungs is called a ..........................-genic squamous cell carcinoma.

broncho
1.25 Many malignant tumors are composed of very primitive, undifferentiated cells, and these tumors are therefore classified as poorly differentiated or undifferentiated. You can guess that if it is a carcinoma, it is called a poorly differentiated ... If it is a sarcoma, it is called a ... 

carcinoma  poorly differentiated sarcoma

1.26 Generally, tumors are divided into three descriptive categories: simple, mixed, and compound neoplasms. Tumors in which the dividing cells are closely related are called ... neoplasms. Tumors of more than one cell type, with the cells originating from one germ layer are called ... neoplasms. Those containing a variety of cell types with the cells originating in more than one germ layer are called ... neoplasms.

simple  mixed  compound

1.27 Mixed and compound tumors are described according to their composition of cells from ... layers.

germ

1.28 The vast majority of medical terms are derived from Greek words. This is true of the names of the three germ layers composing the embryo. For example, the prefixes ecto, meso, and endo all are Greek words meaning outer, middle, and inner, respectively. Likewise, the word derm also is derived from a similar Greek word meaning skin. Thus, by joining the prefixes ecto, meso, and endo to the base word derm, words describing the three germ layers were formed. With this information, do the following:

Name the three germ layers of the embryo:

endoderm  mesoderm  ectoderm  (any order)

1.29 List these layers and tell where each is located.

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ectoderm  outer layer
mesoderm  middle layer
endoderm  inner layer

1.30 List the cells arising from each layer.

<table>
<thead>
<tr>
<th>Germ Layer</th>
<th>Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ectoderm  skin cells, hair follicle cells, sweat gland cells, cells of nervous system
mesoderm  muscle cells, bone cells, fascia, connective tissue cells
endoderm  cells of mucous membrane lining genitourinary tract, gastrointestinal tract, and respiratory tract.

1.31 The process by which a cell develops a specialized shape, characteristic, or function that differs from that of other cells or tissues is called ...................................................

differentiation

1.32 As certain cells develop from stem cells, they take on the specialized shapes, characteristics, and functions of skin cells, bone cells, muscle cells, and so forth. These cells are said to be going through the process of ..........................................................

differentiation

1.33 Scientists believe that all human cells develop from parent or ancestor cells called stem cells. The theory that states that all human cells develop from parent cells called ............ is the .................................. theory.

stem cells  stem cell