Cancer: Good Cells Gone Bad
Lecture Review Assignment
Patricia J. Clark, Ph.D.
Department of Biology, IUPUI

Assignment Objectives:

- Understand the basic terminology associated with cancer
- Understand the genetic transformation of a normal cell to a cancer cell
- Understand the basic problems associated will cancer cell regulation and growth
- Understand the steps usually involved in the development of cancer
- Understand the normal beneficial response of the immune system to cancer cells
- Understand the process and potential consequences of cancer cell metastasis
- Understand the benefits of detection of circulating cancer cells

Section I: Terminology

1. The following terms are often used interchangeably by the general public. However, all these words do not mean the same thing. What do each of the following terms mean?

- Neoplasm
- Tumor
- Benign
- Malignant
- Cancer

2. Why do you think these terms are so often (although incorrectly) used interchangeably?

3. Is it important that an individual faced with a diagnosis of one of these understands the meaning of the term? For example, what difference does it make to understand that your tumor is benign rather than malignant or visa versa?

Section II: Cell Transformation

1. Cancer cells begin as normal cells that have been transformed. This transformation is the result of changes in gene structure, regulation, and activity. How does each of the following affect the normal function of a gene?

- Mutation
- Proto-oncogene
- Oncogene
- Tumor suppressor gene
- DNA repair gene

2. The two major changes that occur as a result of cell transformation are in cell differentiation and cell proliferation. Define each of these terms and explain their relationship to cancer.

- Cell differentiation
- Cell proliferation

Section III: Development of Cancer

1. The transformation of normal cells to cancerous cells is usually not an immediate one. The development of cancer generally requires several steps. Identify the process that occurs in each of the following steps in cancer development.

- Initiation
- Promotion
- Progression

Section IV: Cancer Cell Growth

1. Normal cells have a genetically programmed life. Normal cells have each of the following characteristics. Define each of the following cell characteristics and explain why a change in or the lack of each causes problems with cell regulation.

- Cell generation time
- Cell death or apoptosis
- Contact inhibition

Section V: Role of the Immune System in Cancer Prevention

1. The immune system is usually associated with the destruction of pathogenic agents from outside the body. However, the immune system also plays important roles in dealing with cancer cells. Under normal circumstances, the immune system is responsible for identifying self from non-self. In the situation of cancer cells, these cells should be recognized as non-self. How would each of the following assist in cancer detection?

- Tumor-associated antigens
- Immunological surveillance

2. Of the leukocytes, the following cell types usually play the largest role in cancer cell destruction. What are the functions of each of the following white blood cells in cancer cell destruction?

- Cytotoxic T cells
- Natural killer cells
- Macrophages
- B lymphocytes

Section VI: Metastasis

1. When cancer cells infiltrate surrounding tissues and move into the lymphatic and vascular systems, they can spread from their tissue of origin to other areas of the body. Define the following terms associated with this movement.

- Metastasis
- Primary tumor
- Secondary or metastatic tumor

2. How might the medical treatment a cancer patient differ between a patient with a tumor that is restricted to its primary site versus a patient with a tumor that has metastasized?

Section VI: Detection of Circulating Cancer Cells

1. When cancer cells are detected at a primary site, the surrounding lymph nodes are often checked for cancer cells as well. What would checking the surrounding lymph node tell the physicians?

2. An experimental procedure is currently being tested that identifies cancer cells in blood circulation. The detection of the cancer cells uses immunofluorescence and monoclonal antibodies that bind to antigens found on the cancer cells. The additional staining and observation of the cancer cells then allows a comparison of the circulating cancer cells with cancer cells of the known tumor (Marrinucci et. al., 2007). How might the ability to identify and characterize circulating cancer cells be useful in the development of a treatment?

Bibliography

Crowley, L.V. 2004. An Introduction to Human Disease: Pathology and Pathophysiology Correlations, 6th ed. Jones and Bartlett Publishers, Sudbury, Mass.

Lewis, S. M., M. m. Heitkemper, and S. R. Dirksen. 2004. Medical – Surgical Nursing: Assessment and Management of Clinical Problems, 6th ed. Mosby, St. Louis.

Marrinucci, D., K. Bethel, R. H. Bruce, D. N. Curry, B. Hsieh, M. Humphrey, R. T. Krivacic, J. Kroener, L. Kroener, A. Ladanyi, N. H. Lazarus, J. Nieva, and P. Kuhn. 2007. Case Study of the Morphological Variation of Circulating Tumor Cells. Human Pathology 38, 514-519.