**Evolution and Cancer**

When most people hear the word “evolution,” they think of changes in species occurring over many thousands of years. Now, some scientists have proposed that natural selection occurs as normal cells progress from pre-cancerous cells to malignant cancer cells. These scientists are beginning to apply principles of evolutionary biology to the study of cancer.

The underlying cause for the cancer is mutation—changes in genes. Once a mutation occurs, mutant cells struggle to survive, reproduce, and possibly mutate further in the body’s internal environment. With an increasing number of mutations, the cells within a tumor become increasingly different from each other. These differences may give some cells survival and reproductive advantages over their neighbors. It’s survival of the fittest, with every cell for itself.

The “Hallmarks of Cancer” describe the characteristics that cancer cells may acquire as a result of mutations. Each of these hallmarks affects the fitness, the survival, and reproduction of cancer cells.

1. Explore the “Hallmarks of Cancer” section of the Inside Cancer site at [www.insidecancer](http://www.insidecancer).org. For each hallmark of cancer, explain how that characteristic makes cancer cells more “fit” for competing, surviving and reproducing in the body’s internal environment.

**Growing uncontrollably**

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**Evading death**

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**Processing Nutrients**

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**Becoming immortal**

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**Invading tissues**

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**Avoiding detection**

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**Promoting mutation**

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**Evolution and Cancer**

**Understanding the hallmarks of cancer can help prevent, diagnose, treat, or prevent cancer.**

**Key: Hallmarks of Cancer**

1. **Growing uncontrollably**
2. **Evading death**
3. **Processing nutrients**
4. **Becoming immortal**
5. **Invading tissues**
6. **Avoiding detection**
7. **Promoting mutations**

**Identify the hallmark of cancer that is most closely related to each of the following statements. Explain your answer in the space provided.**

1. Genetic instability can lead to progression in the number of hallmarks of cancer that cells exhibit. \_\_\_\_\_Explain your answer.
2. Cancer treatments may use drugs or radiation to kill or slow the division of actively dividing cells \_\_\_\_\_\_\_\_ Explain your answer.
3. Cancer treatments may use antibodies or vaccines to target cancer cells? \_\_\_\_\_\_\_ Explain your answer.
4. Cancer treatments may use drugs that signal cells to undergo apoptosis? \_\_\_\_\_\_ Explain your answer.
5. Cancer treatments may use drugs that block angiogenesis? \_\_*\_*\_ Explain your answer.
6. People should reduce their risks of developing skin cancer by applying sunscreens and avoiding exposure to sunlight. \_***\_\_***\_ Explain your answer.
7. Exposure to tobacco products and other carcinogens (cancer causing substances) can increase people’s risk of developing cancer. \_***\_\_***\_\_ Explain your answer.
8. Cancer screening tests are used to detect cancer in early stages before metastasis has occurred. \_\_\_\_\_\_
9. Researchers hope to identify chemicals that might block the action of telomerase enzymes. \_\_\_\_\_ Explain your answer.
10. Some cancer drugs block receptors that receive growth stimulatory signals. \_\_\_\_\_\_\_\_\_\_ Explain your answer.
11. Some types of cancer are caused by genes that interfere with the action of DNA repair *enzymes. \_\_\_\_\_\_\_\_ Explain your answer.*

Diagnosis & Treatment

1. What percent of cancer is inherited?
2. Define ‘hot spot’.
3. Where is lung cancer most prevalent?
4. What is the leading cause of cancer deaths in the United States? Why?
5. Give a half page summary on the following tabs regarding causes of cancer:
   1. Smoking
   2. Diet
   3. Mold
   4. Viruses
   5. Sunlight