

## Lesson 4 Problem Set: Angiogenesis and Metastasis

### Teacher's Answers

#### Short Answer:

1. Why is angiogenesis important for tumor growth?

A: A tumor that has grown to a certain size needs nutrients and oxygen, otherwise it won't grow any further. The recruitment of new blood vessels that infiltrate the tumor (angiogenesis), allow the innermost part of the tumor to receive nutrients and oxygen and therefore, continue to grow.

2. Besides nutrients, what else do blood vessels allow the tumor to do?

B: Tumor cells can detach from the primary tumor and use the blood supply to travel the host's circulation in order to take up residence elsewhere in the body (metastasis).

3. List the steps of metastasis:

A: Angiogenesis  
Detachment from primary tumor  
Intravasation  
Evasion of host defense  
Arrest at a distant site  
Attachment  
Extravasation  
Establishment of new growth

4. Why is early detection so important in cancer in terms of metastasis.

A: The goal of early detection is to catch the tumor while it remains local. Once it has had a chance to enter circulation, you might be able to remove the primary tumor, however, you could have metastases and growth of new tumors elsewhere.

5. What kind of cells are blood vessels made up of?

A: Endothelial cells

**True/False:** Determine whether the statements below are true or false. If you choose false, please explain which part(s) of the statements are incorrect.

1. Tumor cells metastasize only by traveling through the host's blood circulation.

**A: False; tumor cells can also invade the lymph system and travel through lymphatic vessels**

2. There are several steps in metastasis. A tumor cell must complete each step before moving on to the next one.

**A: True**

3. Once angiogenesis is established, it is almost certain that tumor cells will metastasize because it is very easy for tumor cells to survive in circulation.

**A: False; it is very difficult for tumor cells to survive in circulation. In fact, only 1 out of 10,000 cells that enter circulation will survive.**

4. The strategy behind angiogenesis inhibitors is to feed the tumor with poison through the new blood network that the tumor has established.

**A: False; the idea behind angiogenesis is to cut off the tumor's blood supply so that you can "starve" the tumor of nutrients and oxygen, keeping it dormant and manageable.**

**Vocabulary: Define the following terms:**

1. Metastasis:

**A: The migration of cancer cells from the original tumor site through the blood and lymph vessels to produce cancers in other tissues. Metastasis also is the term used for a secondary cancer growing at a distant site.**

## 2. Intravasation:

A: The process by which tumor cells invade and enter into the blood circulation or lymphatic system.

## 3. Extravasation:

A: The process by which tumor cells exit out of the blood vessel.

## 4. Angiogenesis:

A: the formation of new blood vessels from pre-existing ones

## 5. VEGF

A: Vascular Endothelial Growth Factor; a molecule that is secreted by tumor cells and stimulates the growth of endothelial cells and the production of new blood vessels