

## Angiogenesis Inhibitors Therapy: Questions and Answers

### Key Points

- Angiogenesis is the formation of new blood vessels and is controlled by chemicals in the body (see Question 1).
- Tumors need blood vessels to grow and spread (see Question 2).
- Angiogenesis inhibitors prevent the formation of new blood vessels so that the tumor cannot grow (see Question 3).
- The U.S. Food and Drug Administration (FDA) has approved some angiogenesis inhibitors for the treatment of cancer (see Question 4).
- Angiogenesis inhibitors have fewer side effects than many other cancer treatments, but they may only limit the growth of the cancer, not “cure” it (see Questions 5, 6, and 7).
- Researchers continue to test new angiogenesis inhibitors and to investigate the way these drugs or chemicals work against different cancers (see Question 8).

### 1. What is angiogenesis?

Angiogenesis is the formation of new blood vessels. Angiogenesis is a process controlled by certain chemicals produced in the body. Some of these chemicals stimulate cells to repair damaged blood vessels or form new ones. Other chemicals, called angiogenesis inhibitors, signal the process to stop.

### 2. Why is angiogenesis important in cancer?

Angiogenesis plays an important role in the growth and spread of cancer. New blood vessels “feed” the cancer cells with oxygen and nutrients, allowing these cells to grow, invade nearby tissue, spread to other parts of the body, and form new colonies of cancer cells.



**3. How can angiogenesis be stopped in tumors?**

Because tumors cannot grow or spread without the formation of new blood vessels, scientists are trying to find ways to stop angiogenesis. They are studying natural and synthetic angiogenesis inhibitors, also called antiangiogenic agents, in the hope that these chemicals will prevent or slow down the growth of cancer by blocking the formation of new blood vessels.

**4. Are any angiogenesis inhibitors currently being used to treat cancer in humans?**

Yes. The U.S. Food and Drug Administration (FDA) has approved bevacizumab (Avastin®) for use with other drugs to treat colorectal cancer that has spread to other parts of the body, some non-small cell lung cancers, and some breast cancers that have spread to other parts of the body. Bevacizumab was the first angiogenesis inhibitor proven to delay tumor growth and, more importantly, extend the lives of patients.

The FDA has also approved other drugs with antiangiogenic activity as cancer therapies for multiple myeloma, mantle cell lymphoma, gastrointestinal stromal tumors (GIST), and kidney cancer.

Researchers are also exploring the use of these drugs to treat other cancers (see Question 8).

**5. What are the advantages of angiogenesis inhibitors?**

Angiogenesis inhibitors usually have only mild side effects and are not toxic to most healthy cells. Tumors do not seem to develop a resistance to angiogenesis inhibitors, even when given over a long period of time, unlike the resistance seen when chemotherapy drugs are used.

Angiogenesis inhibitors seem to help some chemotherapy drugs and radiation therapy work more effectively when given in combination.

**6. What are the limitations of angiogenesis inhibitors?**

Angiogenesis inhibitor therapy may not necessarily kill tumors, but instead may keep tumors stable. Therefore, this type of therapy may need to be administered over a long period. Because angiogenesis is important in wound healing and in reproduction, long-term treatment with antiangiogenic agents could cause problems with bleeding, blood clotting, heart function, the immune system, and the reproductive system (1).

**7. Does angiogenesis inhibitor therapy have any complications or side effects?**

A patient's immune system may be compromised, making the patient more susceptible to infection and causing wounds to heal poorly, if at all. Patients may experience reproductive problems, and damage to the fetus is likely if a patient becomes pregnant

while taking the antiangiogenic drug. Heart problems and high blood pressure could be made worse, and bleeding or blood clots could increase (1).

Since angiogenesis inhibitor therapy is still under investigation, all of the possible complications and side effects are still unknown.

## **8. What does the future hold for angiogenesis inhibitor therapy?**

Other angiogenesis inhibitors are currently being tested in clinical trials (research studies) but have not yet been shown to be effective against cancer in humans. If these angiogenesis inhibitors are proven to be both safe and effective in treating human cancer, they may be approved by the FDA and made available for widespread use.

The list below includes cancers that are being studied in active phase III treatment clinical trials using angiogenesis inhibitors. The clinical trials are in the National Cancer Institute's (NCI) Physician Data Query (PDQ®) Cancer Clinical Trials Registry at <http://www.cancer.gov/clinicaltrials/search> on the Internet. For information about how to search the registry, see "Help Using the Basic Clinical Trial Search Form" at <http://www.cancer.gov/clinicaltrials/basic-search-form-help> on the Internet.

### **Types of Cancer in Active Phase III Treatment Clinical Trials of Angiogenesis Inhibitors:**

- Breast cancer
- Esophageal cancer
- Gastrointestinal Stromal Tumors (GIST)
- Kidney (renal cell) cancer
- Leukemia
- Liver (adult primary) cancer
- Lymphoma
- Melanoma
- Multiple myeloma
- Non-small cell lung cancer (NSCLC)
- Prostate
- Stomach (gastric) cancer
- Pancreatic cancer

For more information about the PDQ Cancer Clinical Trials Registry and other cancer-related information, call NCI's Cancer Information Service at 1-800-4-CANCER (1-800-422-6237).

## Selected Reference

1. Cohen MH, Gootenberg J, Keegan P, Pazdur R. FDA drug approval summary: Bevacizumab plus FOLFOX4 as second-line treatment of colorectal cancer. *The Oncologist* 2007; 12(3):356–361.

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## Related NCI materials and Web pages:

- National Cancer Institute Fact Sheet 2.11, *Clinical Trials: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/Information/clinical-trials>)
- National Cancer Institute Fact Sheet 6.7, *Cancer: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/Sites-Types/general>)
- National Cancer Institute Fact Sheet 7.2, *Biological Therapies for Cancer: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/Therapy/biological>)
- National Cancer Institute Fact Sheet 7.49, *Targeted Cancer Therapies: Questions and Answers* (<http://www.cancer.gov/cancertopics/factsheet/Therapy/targeted>)
- *What You Need To Know About™ Cancer* (<http://www.cancer.gov/cancertopics/wyntk/overview>)

## For more help, contact:

### NCI's Cancer Information Service

Telephone (toll-free): 1-800-4-CANCER (1-800-422-6237)

TTY (toll-free): 1-800-332-8615

*LiveHelp*® online chat: <https://cissecure.nci.nih.gov/livehelp/welcome.asp>

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