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## Angiogenesis and Angiogenesis Inhibitors to Treat Cancer

[1]

This section has been reviewed and approved by the [Cancer.Net Editorial Board \[2\]](#), 07/2014

### Key Messages:

- Angiogenesis, the process by which new blood vessels are formed, underlies much of the growth and spread of cancer.
- Drugs that are designed to stop angiogenesis are called angiogenesis inhibitors.
- Several angiogenesis inhibitors are approved by the U.S. Food and Drug Administration to treat a variety of cancers.
- Angiogenesis inhibitors can have side effects; talk with your doctor about the benefits and risks of each of your treatment options.

Angiogenesis is the formation of new blood vessels. This process is a normal part of growth and healing. It is also connected to the development of several diseases, including cancer.

Once a tumor grows to a certain size, it requires nutrients and oxygen found in the blood to help it grow, invade nearby tissues, and spread, called metastasis. The tumor sends chemical signals out that stimulate the growth of new blood vessels that carry the blood to it. As a result, each part of the angiogenesis process is a potential target for new cancer treatments. The idea is that if a drug can stop the tumor from receiving a blood supply, the tumor will "starve" and die.

Drugs that block angiogenesis, which are called angiogenesis inhibitors or anti-angiogenics, have become an important part of treatment for many types of cancer.

### Cancer treatments that block angiogenesis

The following drugs are examples of angiogenesis inhibitors approved by the U.S. Food and Drug Administration to treat cancer. Typically, these drugs are given with other types of treatment, such as chemotherapy.

- **Bevacizumab (Avastin)**, a substance called a monoclonal antibody produced in the laboratory, is used to treat [colorectal cancer \[3\]](#), [kidney cancer \[4\]](#), and [lung cancer \[5\]](#). It is injected into a vein.

- **Everolimus (Afinitor)** is used to treat kidney cancer, advanced breast cancer [6], a rare type of noncancerous brain tumor called subependymal giant cell astrocytoma, and pancreatic neuroendocrine tumors [7] (PNETs). It is a pill taken by mouth.
- **Lenalidomide (Revlimid)** is used to treat multiple myeloma [8]; tumors involving cells that normally produce antibodies; and mantle cell lymphoma, a type of non-Hodgkin lymphoma [9]. It is a pill taken by mouth.
- **Pazopanib (Votrient)** is used to treat kidney cancer and advanced soft tissue sarcoma [10]. It is a pill taken by mouth.
- **Ramucirumab (Cyramza)** is used to treat advanced stomach cancer [11] and gastroesophageal junction adenocarcinoma, a form of cancer located where the stomach joins to the esophagus. It is injected into a vein.
- **Sorafenib (Nexavar)**, which works in many ways, including blocking angiogenesis, is used to treat kidney cancer, liver cancer [12], and thyroid cancer [13]. It is a pill taken by mouth.
- **Sunitinib (Sutent)** is used to treat kidney cancer, PNET, and gastrointestinal stromal tumor [14]. It is a pill taken by mouth.
- **Thalidomide (Thalomid)** appears to stop cells called endothelial cells that line blood vessels from forming new blood vessels and is a treatment for multiple myeloma. Thalidomide should not be taken by women who are pregnant or plan to become pregnant because it is harmful to fetuses. It is a pill taken by mouth.

Many of these drugs are also being studied for use in other types of cancer that may not be listed here. Talk with your doctor to get more information about these and other angiogenesis inhibitors, as well as ones that are being evaluated in clinical trials [15].

### Side effects of angiogenesis inhibitors

Because angiogenesis is important to many of the body's normal processes, angiogenesis inhibitors can cause a wide range of side effects, including:

- High blood pressure
- A rash and/or dry, itchy skin
- Hand-foot syndrome (tender, thickened areas on the skin, sometimes with blisters, on palms and soles)
- Diarrhea
- Fatigue
- Low blood counts
- Problems with wound healing or cuts re-opening

Although some of these side effects may be common, they do not happen with every drug or with every person. In addition, they can often be treated with medication.

Rarely, angiogenesis inhibitors may cause serious bleeding, heart attacks, heart failure, or blood clots. People at higher risk for these conditions should discuss the risks and benefits of these treatments and ways to monitor these risks. For example, patients who had chemotherapy with a class of drugs called anthracyclines or radiation therapy to the chest wall have a higher risk of heart failure with bevacizumab. Another rare side effect is bowel perforations (holes) in the intestines, which usually require surgery to correct.

## Questions to ask your doctor

Consider asking your doctor the following questions about angiogenesis inhibitors:

- Do you recommend that an angiogenesis inhibitor be a part of my treatment plan? Which one? Why?
- What are the risks and benefits of the drug?
- What are the potential short-term and long-term side effects of the drug?
- How long will I need to take the drug?
- How is this drug different from chemotherapy or other treatments?
- Will this drug be used in addition to other treatments?
- What clinical trials are open to me?
- If I am worried about managing the costs related to my cancer care, who can help me with these concerns?
- Is there anything else I should be asking?

## More Information

[Targeted Treatments \[16\]](#)

[Skin Reactions to Targeted Therapies \[17\]](#)

[Side Effects \[18\]](#)

## Additional Resources

[The Angiogenesis Foundation: Treatments \[19\]](#)

[National Cancer Institute: Angiogenesis Inhibitors \[20\]](#)

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### Links:

[1] <http://www.cancer.net/navigating-cancer-care/how-cancer-treated/personalized-and-targeted-therapies/angiogenesis-and-angiogenesis-inhibitors-treat-cancer>

[2] <http://www.cancer.net/about-us>

[3] <http://www.cancer.net/node/31317>

[4] <http://www.cancer.net/node/31256>

[5] <http://www.cancer.net/node/31273>

[6] <http://www.cancer.net/node/31322>

[7] <http://www.cancer.net/node/31394>

[8] <http://www.cancer.net/node/31400>

[9] <http://www.cancer.net/node/31269>

[10] <http://www.cancer.net/node/31379>

[11] <http://www.cancer.net/node/31376>

[12] <http://www.cancer.net/node/31274>

[13] <http://www.cancer.net/node/31262>

[14] <http://www.cancer.net/node/31299>

[15] <http://www.cancer.net/node/24863>

[16] <http://www.cancer.net/node/24729>

[17] <http://www.cancer.net/node/25056>

[18] <http://www.cancer.net/node/25238>

[19] <https://www.angio.org/learn/treatments/>

[20] <http://www.cancer.gov/cancertopics/factsheet/Therapy/angiogenesis-inhibitors>