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# Treating Malignant Mesothelioma

## How is mesothelioma treated?

The main factors in selecting treatment for mesotheliomas are the location and extent of the tumor, whether it has spread to lymph nodes or other organs, and your health and personal preferences. Based on these factors, your treatment options may include:

- [Surgery for Malignant Mesothelioma](#)
- [Palliative Procedures for Malignant Mesothelioma](#)
- [Radiation Therapy for Malignant Mesothelioma](#)
- [Chemotherapy for Malignant Mesothelioma](#)
- [Immunotherapy for Malignant Mesothelioma](#)
- [Targeted Therapy for Malignant Mesothelioma](#)

## Common treatment approaches

Mesothelioma can be hard to treat because it typically does not grow as a single tumor mass. It tends to spread along nearby surfaces, nerves, and blood vessels. This often makes it very hard to get rid of the cancer completely with surgery and/or radiation. For some people, palliative procedures might be used to help treat some symptoms of mesothelioma.

Because mesothelioma is a rare cancer, it has been hard for doctors to compare the value of different treatments. Only a few large clinical trials of treatments for mesothelioma have been done. In addition, many doctors have very little experience treating this disease. They usually refer patients to specialists who treat large numbers of mesothelioma patients at major medical centers.

- [Treatment of Mesothelioma Based on the Extent of the Cancer](#)

## Who treats mesothelioma?

You might have different types of doctors on your treatment team, depending on the stage of your cancer and your treatment options. These doctors may include:

- A **thoracic surgeon**: a doctor who treats diseases of the lungs and chest with surgery
- A **surgical oncologist**: a doctor who treats cancer with surgery
- A **radiation oncologist**: a doctor who treats cancer with radiation therapy.
- A **medical oncologist**: a doctor who treats cancer with medicines such as chemotherapy
- A **pulmonologist**: a doctor who specializes in medical treatment of diseases of the lungs

Many other specialists may be involved in your care as well, including nurse practitioners, nurses, psychologists, social workers, rehabilitation specialists, and other health professionals.

- [Health Professionals Associated With Cancer Care](#)

## Making treatment decisions

Before deciding on a treatment plan, it's very important to have an idea of its likely benefits and possible risks. You will probably have many questions about the treatment options suggested. If there's anything you don't understand, ask to have it explained.

Mesotheliomas are rare, so if time allows it's often a good idea to get a second opinion from a doctor who has a lot of experience in treating people with these cancers. A second opinion can give you more information and help you feel more confident about the treatment plan you choose.

- [Questions To Ask About Malignant Mesothelioma](#)
- [Seeking a Second Opinion](#)

## Thinking about taking part in a clinical trial

Clinical trials are carefully controlled research studies that are done to get a closer look at promising new treatments or procedures. Clinical trials are one way to get state-of-the-art cancer treatment. In some cases they may be the only way to get access to newer treatments. They are also the best way for doctors to learn better methods to

treat cancer. Still, they're not right for everyone.

If you would like to learn more about clinical trials that might be right for you, start by asking your doctor if your clinic or hospital conducts clinical trials.

- [Clinical Trials](#)

## **Considering complementary and alternative methods**

You may hear about alternative or complementary methods that your doctor hasn't mentioned to treat your cancer or relieve symptoms. These methods can include vitamins, herbs, and special diets, or other methods such as acupuncture or massage, to name a few.

Complementary methods refer to treatments that are used along with your regular medical care. Alternative treatments are used instead of a doctor's medical treatment. Although some of these methods might be helpful in relieving symptoms or helping you feel better, many have not been proven to work. Some might even be harmful.

Be sure to talk to your cancer care team about any method you are thinking about using. They can help you learn what is known (or not known) about the method, which can help you make an informed decision.

- [Complementary and Alternative Medicine](#)

## **Help getting through cancer treatment**

People with cancer need support and information, no matter what stage of illness they may be in. Knowing all of your options and finding the resources you need will help you make informed decisions about your care.

Whether you are thinking about treatment, getting treatment, or not being treated at all, you can still get supportive care to help with pain or other symptoms. Communicating with your cancer care team is important so you understand your diagnosis, what treatment is recommended, and ways to maintain or improve your quality of life.

Different types of programs and support services may be helpful, and can be an important part of your care. These might include nursing or social work services, financial aid, nutritional advice, rehab, or spiritual help.

The American Cancer Society also has programs and services – including rides to

treatment, lodging, and more – to help you get through treatment. Call our National Cancer Information Center at 1-800-227-2345 and speak with one of our trained specialists.

- [Palliative Care](#)
- [Find Support Programs and Services in Your Area](#)

### **Choosing to stop treatment or choosing no treatment at all**

For some people, when treatments have been tried and are no longer controlling the cancer, it could be time to weigh the benefits and risks of continuing to try new treatments. Whether or not you continue treatment, there are still things you can do to help maintain or improve your quality of life.

Some people, especially if the cancer is advanced, might not want to be treated at all. There are many reasons you might decide not to get cancer treatment, but it's important to talk to your doctors and you make that decision. Remember that even if you choose not to treat the cancer, you can still get supportive care to help with pain or other symptoms.

- [If Cancer Treatments Stop Working](#)

*The treatment information given here is not official policy of the American Cancer Society and is not intended as medical advice to replace the expertise and judgment of your cancer care team. It is intended to help you and your family make informed decisions, together with your doctor. Your doctor may have reasons for suggesting a treatment plan different from these general treatment options. Don't hesitate to ask him or her questions about your treatment options.*

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## **Surgery for Malignant Mesothelioma**

Surgery for mesothelioma may be done:

- To try to cure the cancer (potentially curative surgery)
- To relieve pain and other symptoms caused by the tumor (palliative surgery)

**Potentially curative surgery** may be an option if you're in otherwise good health and the cancer can be removed completely. But even when the surgeon removes all of the cancer that can be seen, some cancer cells are often left behind. These cells can grow and divide, causing the cancer to come back after surgery. Because of this, not all doctors agree on the exact role of surgery. In most cases it won't cure you, but it could help you live longer. Still, potentially curative surgery is being done in some major cancer centers, and a small number of people who have had the surgery have had long periods of time with no sign of cancer.

**Palliative surgery** may be an option if the tumor has already spread beyond where it started and would be hard to remove completely. It may also be used if you're too ill for a more extensive operation. The goal of this surgery is to ease or prevent symptoms, not to cure the cancer.

## Types of surgery for pleural mesothelioma

Either potentially curative or palliative surgery might be used for pleural mesothelioma. But in most cases, these tumors have spread too far to be removed completely. Sometimes, the surgeon might not be able to tell the full extent of the cancer – and not know which type of surgery might be best – until the operation has started.

**Extrapleural pneumonectomy (EPP):** This is a major operation, but it may offer the best chance to remove all of the cancer for many patients. It might be used when the surgeon thinks a cure is possible – mostly in patients with resectable epithelioid mesothelioma that has not spread to the lymph nodes.

In EEP, the surgeon removes the lung on the side of the cancer along with the pleura lining the chest wall on that side, the diaphragm (thin breathing muscle) on that side, maybe the pericardium (the sac around the heart), and nearby lymph nodes. The diaphragm and the pericardium are then rebuilt with man-made materials.

This is a complex operation that's only done by experienced surgeons in large medical centers. You must be in good overall health with good lung function and no other serious illnesses to withstand EEP. A lot of tests must be done beforehand to be sure you're healthy enough for this surgery. About 1 in 3 patients who have this operation can have major complications.

**Pleurectomy/decortication (P/D):** This is a less extensive operation in which all of the pleura lining the chest wall (on the side with the cancer) is removed, along with the pleura coating the lung on that same side. The pleura coating the mediastinum and the diaphragm is also removed. The lung and diaphragm muscle are not removed.

In a slightly more extensive version of this operation ( a radical orextended P/D), the diaphragm on the side with cancer and/or pericardium are removed too.

This surgery can be used to try to cure some early cancers, but it can also be used as a palliative procedure to relieve symptoms if the entire tumor can't be removed. It can help control the buildup of fluid, improve breathing, and lessen pain caused by the cancer.

**Debulking (partial pleurectomy):** The goal of this surgery is to remove as much of the cancer and mesothelioma as possible. In general, less tissue is removed in this operation than in a P/D procedure.

### **Possible side effects of surgery**

The operations used to treat mesothelioma can have serious risks and side effects, which depend on the extent of the surgery and the person's health beforehand. Serious complications of EPP can include bleeding, blood clots, wound infections, changes in heart rhythm, pneumonia, fluid build-up in the chest, and loss of lung function. These tend to be less common with less extensive operations.

Because the surgeon must often spread the ribs during surgery, the incision will hurt for some time afterward. Your activity will be limited for at least a month or two.

Studies have suggested that P/D is preferred because there are fewer problems linked to it, and overall outcomes are much the same as, if not better than EPP. P/D tends to be used more often in most treatment centers, but more studies are needed to compare the 2 surgeries. At this time the type of surgery used depends on the hospital and surgeon's experience along with the details of each patient's cancer and overall health, as well as their personal preferences.

### **Surgery for peritoneal mesothelioma**

Surgery for peritoneal mesothelioma can be used to help ease symptoms or to remove the tumor from the wall of the abdomen (belly) and digestive organs. As is the case with pleural mesothelioma, these tumors often have spread too far to be removed completely.

**Debulking:** The goal of this surgery is to remove as much of the mesothelioma as possible. Sometimes this means removing pieces of the intestine as well.

After as much of the visible cancer is removed as possible (but before the operation is

finished), [chemotherapy](#) may be put into the abdomen. This is called **intraoperative or intraperitoneal chemotherapy**. If the chemotherapy drugs are heated, it's called **heated intraoperative chemotherapy or HIPEC**. In either treatment, the drugs are left in for a short time, then they're removed and the incision is closed.

**Omentectomy:** The omentum is an apron-like layer of fatty tissue that drapes over the organs inside the abdomen. Cancers in the peritoneum often spread to this tissue, so it may be removed as part of surgery for peritoneal mesothelioma.

## Surgery for pericardial mesothelioma

Surgery can remove a mesothelioma from the pericardium (the sac around the heart). The entire pericardium may be removed (called a pericardectomy) can be removed to ease pressure on the heart. Surgery may be done to make a hole in the pericardium, which is called a pericardial window. This can be used to put chemo into the area around the heart.

## Surgery for mesothelioma of the tunica vaginalis

Surgery for mesothelioma of the tunica vaginalis, which covers the testicles, rarely cures this cancer. Most of the time surgery is done when the tumor is mistaken for a hernia. The surgeon attempts to treat a suspected hernia and only realizes the diagnosis after the surgery has begun. This kind of mesothelioma can seldom be removed entirely.

## More information about Surgery

For more general information about surgery as a treatment for cancer, see [Cancer Surgery](#)<sup>1</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/surgery.html)
2. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

## References

See all references for Malignant Mesothelioma ([www.cancer.org/cancer/malignant-mesothelioma/references.html](http://www.cancer.org/cancer/malignant-mesothelioma/references.html))

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# Palliative Procedures for Malignant Mesothelioma

Mesotheliomas can often be hard to remove or destroy completely. Still, treatments can often help control it for a time or ease problems it's causing. For instance, some types of [surgery](#) or [chemotherapy](#) might help keep the cancer in check. [Radiation therapy](#) might also be useful to ease chest pain or blockages in the breathing tubes.

## Removing fluid

If pleural mesothelioma is causing fluid to build up in the body, it can often cause trouble breathing and other problems. Sometimes procedures can be used to remove the fluid or help keep it from coming back.

Thoracentesis, paracentesis, and pericardiocentesis are procedures that can be used to take out fluid that has built up and is causing symptoms such as trouble breathing. A long, hollow needle is used to remove the fluid. These procedures are described in [Tests for Malignant Mesothelioma](#).<sup>1</sup> The fluid often builds up again, so these procedures might need to be repeated.

## Pleurodesis

This procedure may be done to try to keep fluid from building up in the chest. A small cut is made in the skin of the chest wall, and a hollow tube (called a chest tube) is put into the chest so that the fluid can drain out. Then, a talc mixed in a fluid (talc slurry), the antibiotic doxycycline, or the chemotherapy drug bleomycin is put into the chest tube. This irritates the linings of the lung (visceral pleura) and chest wall (parietal pleura) so that they stick together, sealing the space and preventing further fluid build-up. The tube

is generally left in for a day or two to drain any new fluid. Pleurodesis can also be done during a [thoracoscopy](#)<sup>2</sup>.

## Shunt placement

A shunt is a device that allows fluid to move from one part of the body to another. For example, a pleuro-peritoneal shunt lets excess fluid in the chest drain into the abdomen (belly). There, it's more likely to be absorbed by the body. A shunt may be used if pleurodesis or other techniques don't work.

The shunt is a long, thin, flexible tube with a small pump in the middle. In the operating room, the doctor puts one end of the shunt into the chest space and the other end into the abdomen. (The pump part stays just under the skin over the ribs.) Once the shunt is in place, the patient pushes down on the pump several times to move the fluid from the chest to the abdomen. This is usually done a few times each day.

## Catheter placement

This is another approach sometimes used to control fluid build-up. One end of the catheter (a thin, flexible tube) is put in the chest (or abdomen for peritoneal mesothelioma) through a small cut in the skin, and the other end is left outside the body. This is done in a doctor's office or hospital. Once in place, the catheter can be attached to a special bottle or other device to drain fluid out on a regular basis.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html)
2. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/how-diagnosed.html)

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# Radiation Therapy for Malignant Mesothelioma

Radiation therapy uses high-energy x-rays or particles to kill cancer cells. Mesotheliomas tend to be hard to treat with radiation therapy. They don't usually grow as single, distinct tumors, so it can be hard to aim radiation at them while avoiding nearby normal tissues. Still, newer techniques give better control of the radiation beams and may make this form of treatment more useful for some people.

Radiation therapy can be used in different ways to treat mesothelioma:

- It can be used after [surgery](#) to try to kill any small areas of cancer that couldn't be seen and removed during surgery. This is called **adjuvant** radiation therapy.
- It can be used as a [palliative procedure](#) to ease symptoms of mesothelioma such as shortness of breath, pain, bleeding, or trouble swallowing.

## Types of radiation therapy

### External beam radiation therapy (EBRT)

This is the main type of radiation therapy used for mesothelioma. It uses x-rays from a machine outside the body to kill cancer cells.

With newer techniques, for example, intensity-modulated radiation therapy (IMRT), doctors can treat mesotheliomas more accurately while reducing the radiation damage to nearby healthy tissues. This might offer a better chance of radiation working, while limiting side effects.

### Brachytherapy

For this type of radiation therapy, a radiation source is put inside the body, in or near the cancer. Brachytherapy is seldom used for mesothelioma unless it's part of a [clinical trial](#).<sup>1</sup>

## Possible side effects

Side effects of external radiation therapy include fatigue, sunburn-like skin problems,

and hair loss where the radiation enters the body. These usually go away once treatment is finished. Chest radiation therapy can damage the lungs over time and lead to trouble breathing and shortness of breath. Abdominal radiation therapy may cause nausea, vomiting, diarrhea, and loss of appetite.

If radiation therapy is used together with [chemotherapy](#), the side effects tend to be worse.

If you're having any side effects from radiation, talk with your treatment team. There are often ways to help control these symptoms.

## More information about radiation therapy

To learn more about how radiation is used to treat cancer, see [Radiation Therapy](#)<sup>2</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>3</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
2. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/radiation.html)
3. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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National Comprehensive Cancer Network, Clinical Practice Guidelines in Oncology (NCCN Guidelines®), Malignant Pleural Mesothelioma, Version 2.2018 -- February 26, 2018. Accessed at [www.nccn.org/professionals/physician\\_gls/pdf/mpm.pdf](http://www.nccn.org/professionals/physician_gls/pdf/mpm.pdf) on November 2, 2018.

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# Chemotherapy for Malignant Mesothelioma

Chemotherapy (chemo) is treatment with anti-cancer drugs. It's used in many different ways to treat mesothelioma. More studies are needed to find the best drugs and the best way to use chemo. Today, the best results are seen when it's used along with surgery.

If mesothelioma can be treated with surgery, chemo may be given first (before surgery) to try to shrink the cancer and lower the risk that it will spread. This is called **neoadjuvant therapy**.

Chemo can also be given after surgery to try to kill any cancer cells that were left behind. This type of treatment, called **adjuvant therapy**, may help delay or help keep the cancer from growing back.

For cancers that can't be removed with surgery, chemo may be the main treatment (alone or along with [radiation therapy](#)). Chemo may shrink the cancer or slow its growth, but it's very unlikely that it will make it go away completely.

## How chemotherapy is given

Doctors usually give chemo in cycles, with each period of treatment followed by a rest period to allow the body time to recover. Chemo cycles generally last about 3 to 4 weeks. Chemo is often not recommended for patients in poor health, but advanced age by itself is not a barrier to getting it.

There are 2 main ways chemo can be given to treat mesothelioma.

### Systemic chemo

In systemic therapy, chemo is injected into the blood through a vein. The drug goes into the bloodstream and travels throughout the body to reach and destroy the cancer cells wherever they may be.

### Intrapleural or intraperitoneal chemo

Chemo drugs can also be put right into the body space where the cancer is – either

intrapleurally (into the chest) or intraperitoneally (into the abdomen). This is done with a small catheter (tube) placed through a small cut in the chest or abdominal wall. Chemo drugs given this way are still absorbed into the bloodstream, but the highest concentrations of the drugs go right to where the cancer cells are.

For intrapleural or intraperitoneal chemo, the drugs are sometimes heated before they are put into the body space. This is called **hyperthermic chemotherapy**. Heating the chemo drugs may help them work better. Sometimes this treatment is given as a single dose in the operating room, right after surgery is done to remove the cancer. This is called **heated intraoperative chemotherapy**. It's more often used to treat peritoneal cancers, in which case it may be called **heated intraperitoneal chemotherapy** or HIPEC.

## Chemotherapy drugs used for mesothelioma

Many chemo drugs can be used to treat mesothelioma, including:

- Pemetrexed (Alimta<sup>®</sup>)
- Cisplatin
- Carboplatin
- Gemcitabine (Gemzar<sup>®</sup>)
- Vinorelbine

These are often given as combinations of 2 drugs. But single drugs can be used in people who may not be able to tolerate more than one drug.

When 2 drugs are used, most doctors give pemetrexed and cisplatin. Pemetrexed lowers levels of folic acid and vitamin B12 in the body, so patients get these as well to help avoid certain side effects. Other possible combinations include pemetrexed with carboplatin, or cisplatin with gemcitabine.

The drugs used for HIPEC include:

- Cisplatin plus doxorubicin (most common)
- Paclitaxel
- Pemetrexed

## Possible side effects

Chemo drugs attack cells that are dividing quickly, which is why they work against cancer cells. But other cells in the body, such as those in the bone marrow (where new blood cells are made), the lining of the mouth and intestines, and the hair follicles, also divide quickly. These cells are likely to be affected by chemo, which can lead to side effects.

The side effects of chemo depend on the type and dose of drugs given, how they're given, and how long they're used. Common side effects include:

- Hair loss
- Mouth sores
- Loss of appetite
- Nausea and vomiting
- Diarrhea
- Increased chance of infections (from having too few white blood cells)
- Easy bruising or bleeding (from having too few blood platelets)
- Fatigue (from having too few red blood cells)

These side effects usually go away after treatment is finished. There are often ways to lessen these side effects. For example, drugs can be given to help prevent or reduce nausea and vomiting. Be sure to ask your doctor or nurse about medicines to help reduce side effects, and let him or her know if you have side effects, so they can be managed.

Intrathecal or intraperitoneal chemo tends to cause fewer problems than systemic chemo.

Some drugs can have other side effects. For example, cisplatin and carboplatin can damage nerves (called *peripheral neuropathy*). This can sometimes lead to hearing loss or symptoms in the hands and feet such as pain, burning or tingling sensations, sensitivity to cold or heat, or weakness. This usually goes away over time once treatment is stopped, but it can last a long time in some people.

Be sure to report any side effects or changes you notice to your medical team so that you can get them treated right away. In some cases, the doses of the drugs may need to be reduced or treatment may need to be delayed or stopped to keep the effects from getting worse.

## **More information about chemotherapy**

For more general information about how chemotherapy is used to treat cancer, see [Chemotherapy](#)<sup>1</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html)
2. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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See all references for Malignant Mesothelioma ([www.cancer.org/cancer/malignant-mesothelioma/references.html](http://www.cancer.org/cancer/malignant-mesothelioma/references.html))

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## Immunotherapy for Malignant Mesothelioma

Immunotherapy is the use of drugs to stimulate a person's own immune system so it can better recognize and destroy cancer cells.

### Immune checkpoint inhibitors

An important part of the immune system is its ability to keep itself from attacking normal cells in the body. To do this, it uses “checkpoints” – molecules on immune cells that need to be turned on (or off) to start an immune response. Cancer cells sometimes use these checkpoints to keep from being attacked by the immune system. Newer drugs that target these checkpoints hold a lot of promise as cancer treatments. These drugs are called checkpoint inhibitors.

These drugs are used for people whose cancer is still growing after treatment with chemotherapy.

### PD-1 inhibitors

**Pembrolizumab (Keytruda<sup>®</sup>)** and **nivolumab (Opdivo<sup>®</sup>)** are drugs that target PD-1, a protein on immune system cells called T cells. PD-1 helps keep the T cells from attacking other cells in the body. By blocking PD-1, these drugs boost the immune response against cancer cells. This can shrink some tumors or slow their growth.

These drugs are given as an intravenous (IV) infusion every 2 or 3 weeks.

Side effects of these drugs can include fatigue, cough, nausea, itching, skin rash, decreased appetite, constipation, joint pain, and diarrhea.

Other, more serious side effects occur less often. These drugs work by removing the brakes from the body's immune system. Sometimes the immune system then starts attacking other parts of the body, which can cause serious or even life-threatening problems in the lungs, intestines, liver, hormone-making glands, kidneys, or other organs.

### **CTLA-4 inhibitor**

**Ipilimumab (Yervoy®)** is another drug that boosts the immune response, but it has a different target. It blocks CTLA-4, another protein on T cells that normally helps keep them in check.

This drug can be used along with nivolumab to treat mesothelioma, but it's not used alone.

It's given as an intravenous (IV) infusion, usually once every 3 weeks.

The most common side effects from this drug include fatigue, diarrhea, skin rash, and itching.

Serious side effects seem to happen more often with this drug than with the PD-1 inhibitors. Like the PD-1 inhibitors, this drug can cause the immune system to attack other parts of the body, which can lead to serious problems in the intestines, liver, hormone-making glands, nerves, skin, eyes, or other organs. In some people these side effects can be life threatening.

### **Side effects**

Talk to your treatment team about the side effects you should watch for. Most side effects can be treated, and some can even be prevented.

Still, it's very important to report any new side effects during or after treatment with any of these drugs to your health care team right away. If serious side effects do occur, you may need to stop treatment and take high doses of corticosteroids to suppress your immune system.

### **More information about immunotherapy**

To learn more about how drugs that work on the immune system are used to treat cancer, see [Cancer Immunotherapy](#)<sup>1</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/immunotherapy.html)
2. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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# Targeted Therapy for Malignant Mesothelioma

As researchers learn more about the gene and protein changes in mesothelioma, they've tried to develop new drugs to target these changes. Many kinds of cancer are treated with targeted therapy today. Research is being done to see if they might work for mesothelioma, too.

Targeted therapy drugs work differently from standard chemotherapy (chemo) drugs. They sometimes work when standard chemo drugs don't, and they often have different (and less severe) side effects.

## Drugs that target blood vessel formation (VEGF)

Vascular endothelial growth factor (VEGF) is a protein that helps tumors form new blood vessels (a process known as angiogenesis) to get nutrients they need to grow.

Bevacizumab (Avastin<sup>®</sup>) is a drug that stops VEGF from working. It's been found to help people with pleural mesothelioma live longer when it's given along with pemetrexed and cisplatin, when compared to giving these chemo drugs alone.

Bevacizumab, pemetrexed, and cisplatin might be used as the main treatment for mesothelioma that can't be removed with surgery. It may then be followed by "maintenance" bevacizumab for up to a year.

Bevacizumab is given as an infusion into your vein (IV) every 2 or 3 weeks.

## Possible side effects of drugs that target VEGF

Common side effects of these drugs include:

- High blood pressure
- Extreme tiredness (fatigue)
- Bleeding
- Low white blood cell counts (with increased risk of infections)
- Headaches
- Mouth sores
- Loss of appetite
- Diarrhea

Rare, but possibly serious side effects include blood clots, severe bleeding, holes forming in the colon (called perforations), heart problems, kidney problems, and slow wound healing. If a hole forms in the colon it can lead to severe infection and surgery may be needed to fix it.

Another rare, but serious side effect of these drugs is an allergic reaction during the infusion, which could cause breathing problems and low blood pressure. You'll be watched closely while getting targeted therapy.

## More information about targeted therapy

To learn more about how targeted drugs are used to treat cancer, see [Targeted Cancer Therapy](#)<sup>1</sup>.

To learn about some of the side effects listed here and how to manage them, see [Managing Cancer-related Side Effects](#)<sup>2</sup>.

## Hyperlinks

1. [www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html](http://www.cancer.org/treatment/treatments-and-side-effects/treatment-types/targeted-therapy.html)
2. [www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html](http://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects.html)

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## Treatment of Mesothelioma Based on the Extent of the Cancer

The [stage](#)<sup>1</sup> (extent) of mesothelioma is an important factor in determining treatment options. But other factors, such as whether the doctor feels the cancer is resectable (all visible cancer can be removed by surgery), as well as a person's general health and preferences, also play a role.

Mesothelioma tends to be hard to treat, whether the cancer is resectable or not. It's best to be treated by a team of doctors who have a lot of experience with mesothelioma. It's also very important that you understand the goal of treatment before it starts – whether it's to try to cure the cancer or to help relieve symptoms – as well as the possible benefits and risks. This can help you make an informed decision when looking at your treatment options.

### Resectable mesotheliomas

Most stage I and some stage II and III pleural mesotheliomas are potentially resectable, but there are exceptions. Whether a tumor is resectable is also based on the [subtype](#)<sup>2</sup> (most doctors don't believe that sarcomatoid tumors are helped by resection), where it is in the body, how far it has grown into nearby tissues, and if the person is healthy enough to have [surgery](#).

Many people with resectable pleural mesothelioma have it removed by either pleurectomy/decortication (P/D) or extrapleural pneumonectomy (EPP). Surgery is more likely to have long-term benefits in early-stage cancers, where there's a better chance that most or all of the cancer can be removed. EPP might offer the best chance to remove the cancer, but it's a complex and extensive operation that's more likely to cause complications, and not all patients can tolerate it.

Patients with early-stage peritoneal mesotheliomas might also benefit from surgery to take out as much of the cancer as possible. This may be combined with [heated intraperitoneal chemotherapy \(HIPEC\)](#). Some patients have long remissions after this treatment. (This means the cancer is under control and not growing or spreading.)

Surgery may also be helpful for some later-stage cancers, but the benefits are more likely to last only a short time.

Sometimes, the surgeon may think the cancer is resectable based on imaging tests (like CT scans) done before surgery, but once the operation starts it becomes clear that not all of the cancer can be removed. In these cases the surgeon may switch to a less extensive operation like P/D (which is easier to tolerate) or even stop the surgery altogether if it's not likely to be helpful. Treatment would then be the same as for unresectable mesotheliomas (see below).

Doctors are still studying whether giving [chemotherapy](#) (chemo) before surgery (called neoadjuvant therapy) or giving chemo and/or [radiation therapy](#) after surgery (adjuvant therapy) is helpful. Not all doctors agree on the best ways to use these treatments together. Some doctors prefer to give chemo, either before or after surgery. Radiation therapy might be used after surgery, either alone or along with chemo.

If you're not healthy enough to have a major operation, your treatment will be the same as for unresectable mesothelioma (discussed below).

If you have symptoms because of fluid buildup in the chest or abdomen (belly), other approaches such as thoracentesis/paracentesis or pleurodesis may be helpful. (These are described in [palliative procedures](#).)

Because these cancers can be hard to treat, taking part in a [clinical trial](#)<sup>3</sup> of a new, and maybe better, treatment may be another option. These types of studies are usually done in large medical centers.

## Unresectable mesotheliomas

Stage IV mesotheliomas, as well as many earlier-stage mesotheliomas, can't be removed completely by surgery. This might be because of the extent or subtype of the cancer or because a person isn't healthy enough to have an operation.

[Chemo](#) is typically the main treatment for these cancers. It may ease symptoms and shrink or slow the growth of the cancer for a time. Sometimes chemo might be used along with a [targeted therapy drug](#) or with a [device that creates electric fields in the](#)

[tumor](#)<sup>4</sup>. [Immunotherapy](#) may also be an option for some people. Though these treatments may help people live longer, it's very unlikely that they will cure these cancers. Before starting treatment, the goals of the treatment should be clear to you and your family.

In people with early-stage mesotheliomas that are likely to grow slowly and aren't causing any symptoms, watching the cancer closely at first may be a reasonable option. Treatment can then be started if there are signs that the cancer is growing quickly or if it starts to cause symptoms.

Because these cancers can be hard to treat, taking part in a [clinical trial](#)<sup>5</sup> of a new plan for treatment may be a reasonable option.

In many cases, treatment aimed at relieving symptoms and making you more comfortable is a good choice. This could include treatments that prevent or reduce fluid buildup in the body, such as thoracentesis/paracentesis or pleurodesis (described in [palliative procedures](#)). Sometimes [pleurectomy/decortication](#) can help with breathing and pain in the chest.

[Pain management](#)<sup>6</sup> is another important aspect of care for these cancers. Some minor operations and types of radiation therapy can be used to help relieve pain. Doctors can also prescribe strong pain-relieving drugs. Some people with cancer are worried about taking opioid drugs (such as morphine) for fear of being sleepy all the time or becoming addicted to them. But many people get very good pain relief from these medicines without serious side effects. It's very important to let your cancer care team know if you're having pain so that it can be treated.

## Recurrent mesotheliomas

Cancer is called **recurrent** when it come backs after treatment. Recurrence can be local (in or near the same place it started) or distant (spread to organs such as the brain or liver). Mesotheliomas often come back after the initial treatment. If this happens, further treatment options depend on where the cancer is, what treatments have already been used, and a person's overall health.

In most cases the options will be a lot like those listed above for unresectable mesotheliomas. For example, chemo or radiation therapy might be used to try to shrink or slow the growth of the cancer and to relieve any symptoms. Because recurrent mesothelioma is hard to treat, [clinical trials](#)<sup>7</sup> of new types of treatment may be a good option. For more on dealing with cancer that comes back, see [Understanding Recurrence](#)<sup>8</sup>.

## Hyperlinks

1. [www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/staging.html](http://www.cancer.org/cancer/malignant-mesothelioma/detection-diagnosis-staging/staging.html)
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3. [www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html](http://www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html)
4. [www.cancer.org/cancer/malignant-mesothelioma/about/new-research.html](http://www.cancer.org/cancer/malignant-mesothelioma/about/new-research.html)
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8. [www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html](http://www.cancer.org/treatment/survivorship-during-and-after-treatment/understanding-recurrence.html)

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