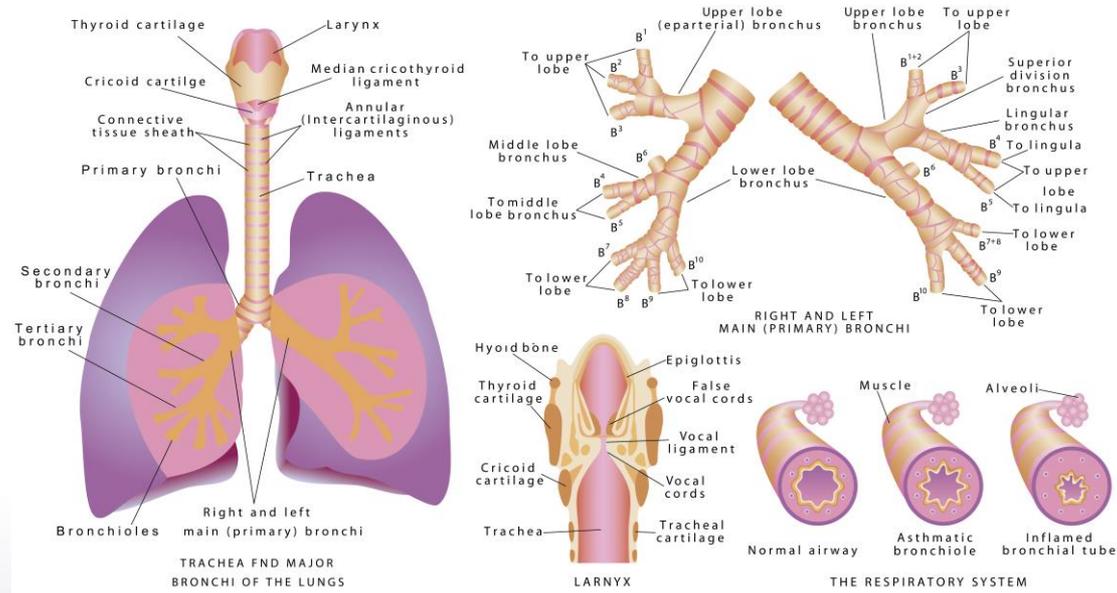


## Lung cancer

### What is lung cancer?

Lung cancer affects cells in an area of your lung. It usually starts in the lining of the main air tubes called the bronchi and bronchioles (**see graphic below**). A cancer (tumour) that affects a tube lining is called a carcinoma. As a tumour grows, it can block off air flow into the lung. It can also spread (metastasise) to lymph nodes and, sometimes, to the chest wall. Tumour spread via the lymph system to the chest wall may make it difficult to expand the chest during breathing, and lead to coughing and shortness of breath. The tumour may also spread to other parts of the body.

### Diagram showing the different parts of the lung



The most common cause of lung cancer is cigarette smoking, which accounts for up to 90% of cases. In non-smokers, lung cancer may be due to genetics (heredity); occupational exposure to radiation or radon gas; air pollution (e.g. diesel exhaust fumes); and passive (second-hand) smoking.

## *Who is most at risk of getting lung cancer?*

In New Zealand, lung cancer is the fourth most common cancer in both men and women, with approximately 2000 people diagnosed with lung cancer each year.<sup>1</sup> However, lung cancer is the leading cause of death from any cancer.<sup>1</sup> This is because it is usually discovered at a late stage; i.e. after it has already spread.

## *Major types of lung cancer*

There are three major types of lung cancer, which depend on the abnormal cells that are present:

- Mesothelioma Non-small cell lung cancer (NSCLC) — about 85% of lung cancers.
- Small cell lung cancer (SCLC) — approximately 10–15% of lung cancers.
- Lung carcinoid tumour (also known as lung neuroendocrine tumour) — about 5% of lung cancers.

Mesothelioma is a type of cancer usually caused by exposure to asbestos, but is not classed as a type of lung cancer.

This document focuses entirely on NSCLC.

For more information about SCLC, refer to <http://www.cancer.org/cancer/lungcancer-smallcell/index>

For additional facts on lung carcinoid tumour, go to <http://www.cancer.org/cancer/lungcarcinoidtumor/index>

## *Major types of NSCLC*

The three major types of NSCLC are:

- Squamous cell (epidermoid) carcinoma — about 25–35% of lung cancers.
- Adenocarcinoma — approximately 40% of lung cancers.
- Large cell (undifferentiated) carcinoma — about 10–15% of lung cancers.

Cells from these three NSCLC types are different in terms of size, shape and chemical content. They are also different in appearance when viewed under a microscope. However, these three NSCLC classes are considered in one category because treatment options and prognosis (outlook) are often alike.

Adenosquamous carcinoma and sarcomatoid carcinoma are other types of NSCLC, but are far less common than the previous three types.

## *How is NSCLC diagnosed?*

### *Signs and symptoms*

Most people with early lung cancer have no symptoms, and the disease often goes unnoticed until it has spread. However, some people with the early stages of lung cancer do have symptoms:

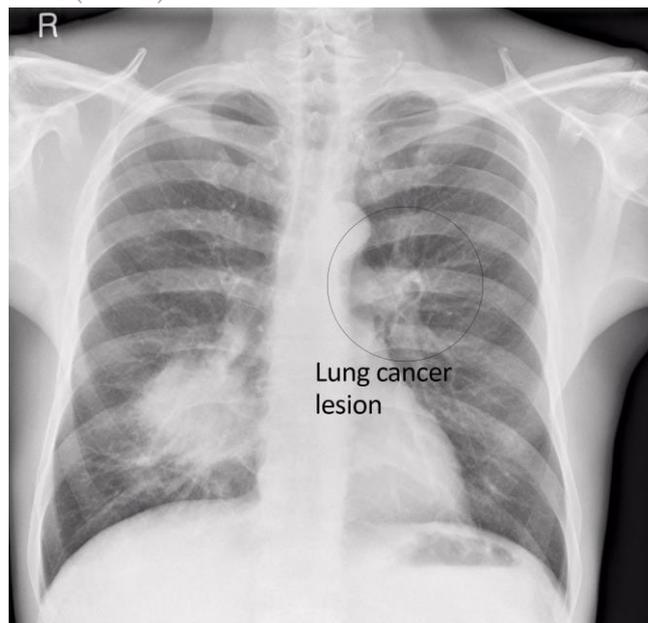
- Noisy breathing or wheezing
- Feeling tired or weak
- Weight loss and loss of appetite
- Shortness of breath
- Hoarseness
- A persistent cough that gets worse over time
- Coughing up blood or rust-coloured spit (sputum or phlegm)
- Chest and upper back pain associated with coughing, deep breathing or laughing
- Frequent chest infections (e.g. bronchitis or pneumonia) that aren't cured or that keep coming back.

## Scans for cancer

Firstly, your doctor will ask questions about your current and previous health, and your smoking and work history. Your doctor will also examine you to search for signs or symptoms of NSCLC or other health problems. If the doctor's initial examination suggests lung cancer, more detailed tests will be needed. These include imaging tests (e.g. chest x-ray, various scans) and microscopic assessment of cells taken from the lung or lung fluids.

A chest x-ray will usually be the first test your doctor will do. If it is normal, then lung cancer is probably absent. Tumours as small as 1 cm in diameter can be seen on chest x-ray (see graphic below), although not all tumours will show up. If your doctor suspects something after x-ray, then more tests may be done.

### Chest x-ray showing a lung tumour (lesion)



A CT scan (computed tomography or CAT scan) is more accurate than a chest x-ray for identifying lung cancer. A CT scanner takes several "pictures" or x-rays of the body, whereas a standard x-ray machine takes only one. A CT scan provides exact details about the size, shape and position of any lung tumour. It can also highlight any large lymph nodes that may contain cancer that has spread from the lung.

An MRI scan (magnetic resonance imaging) is usually used to try to picture any spread of lung cancer to the brain or spinal cord. This type of scan provides extensive images of the body's tissues.

A PET scan (positron emission tomography) is particularly useful if your doctor thinks you may have early stage NSCLC. This test will help to see if the tumour has spread to local (nearby) lymph nodes. Your doctor may then decide that surgery will be helpful. A PET scan can also help to confirm whether an abnormal area on

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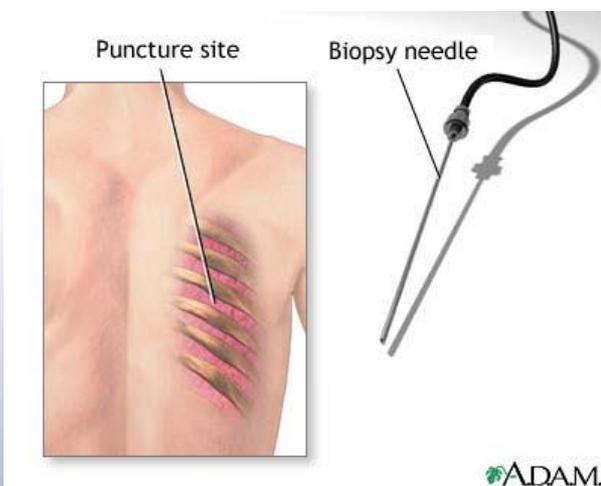
chest x-ray or CT scan is actually lung cancer. In many cases, the PET scan will be combined with a CT scan using a special machine called a PET/CT scanner.

## Other diagnostic tests

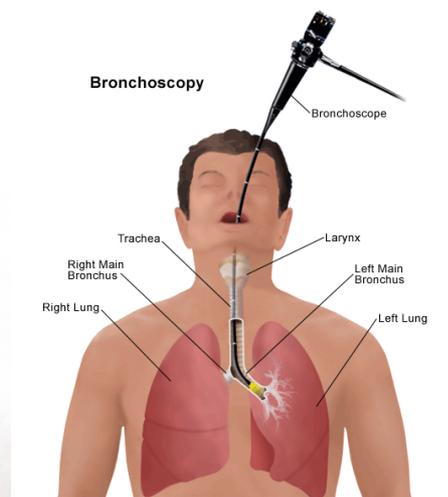
The actual diagnosis of NSCLC is confirmed by looking at lung cells through a microscope. These cells can be collected in a number of different ways:

- *Cell collection from spit.* Usually, an early morning sputum sample is collected for 3 days in a row. This test is useful for finding cancer that starts in the main air pipes (e.g. squamous cell lung cancer).
- *Thoracentesis* can be done when fluid has accumulated around the lungs. A needle is introduced between the ribs. The fluid is then drained and inspected for cancer cells. Such fluid build-up may result from conditions other than NSCLC; e.g. heart failure or infection.
- *Needle biopsy.* Fine needle aspiration (FNA) biopsy is when a doctor uses a very thin, hollow needle to collect lung cells and small pieces of lung tissue (see graphic below). FNA biopsy can also be used to look for cancer in lymph nodes in between the lungs. A larger needle is used in a core biopsy, when the doctor will collect small cylinders or “cores” of lung tissue. Because they provide larger tissue samples, core biopsies are usually used instead of FNA biopsies.
- *Bronchoscopy* can help doctors locate tumours in the large air pipes. A bronchoscope — a flexible tube — is inserted through the nose or mouth. Small instruments are then introduced into the bronchoscope and used to collect tissue samples, brushings or washings. These samples are then viewed through a microscope.

### Needle biopsy of lung tissue



### Bronchoscopy



## *How is NSCLC treated?*

This section provides an overview of treatments for Lung Cancer. Remember each person is different and your doctor will discuss with you the best treatment options for the particular type of cancer you have.

Before treatment, the diagnosis of NSCLC must be confirmed and the disease “staged”. Basically, when NSCLC is staged, the doctor decides how far the disease has spread. The cancer’s stage will then define treatment and prognosis. The tumour-node-metastasis (TNM) staging system is widely used, but this is complex. Essentially, T describes the size of the main tumour; N indicates whether cancer has spread to local (nearby) lymph nodes; and M outlines whether the cancer has spread to other organs. T, N and M are each assigned a score, according to disease severity. These numbers are then combined, and an overall stage grouping (0, I, II, III or IV) is assigned to the cancer: 0 is the least severe; IV is the most severe.

### *Five key treatment options*

After diagnosis and staging, treatment is selected from one or more of the following options:

- Surgery
- Radiofrequency ablation (RFA)
- Radiation therapy
- Chemotherapy
- Targeted treatments.

### *Surgery*

Surgery may be appropriate for early-stage NSCLC and provides the greatest likelihood of a cure. Through an incision in the side of the chest wall, your doctor may perform pneumonectomy (removal of an entire lung), lobectomy (removal of an entire lung section or lobe) or segmentectomy (wedge resection; removal of a lung lobe segment).

### *Radiofrequency ablation (RFA)*

When the NSCLC tumours are small and near the edge of the lung, RFA is an alternative procedure, particularly for people who aren’t strong enough for surgery. A CT scan is used to guide insertion of a probe through the skin and into the tumour. High-energy radio waves and electric current are then passed through the probe. These heat the tumour and destroy the cancer cells.

### *Radiation therapy*

Radiation therapy uses x-rays or other high-energy rays or particles to kill tumour cells. External beam radiation therapy (EBRT) targets radiation from outside the body onto the tumour.

## *Chemotherapy*

Chemotherapy consists of injected or swallowed medicines that enter the bloodstream and go everywhere in the body. Chemotherapy (with or without radiation therapy) can be used before surgery (neoadjuvant treatment) to shrink the tumour, after surgery (adjuvant treatment) to kill any cancer cells that are left, or as the main treatment in advanced NSCLC, when surgery is not possible. Chemotherapy is usually given in cycles. That is, a treatment phase of 1–3 days is generally followed by a “rest” phase of 3–4 weeks to allow the body to recover. In NSCLC, chemotherapy is usually given as a combination of two therapies (e.g. cisplatin or carboplatin plus another medicine; or gemcitabine plus vinorelbine or paclitaxel). In advanced disease, 4–6 cycles of treatment are typically given.

## *Targeted treatments*

These treatments specifically target changes inside tumour cells that are helping the tumour to grow. These treatments sometimes work when chemotherapy doesn't, usually have less severe side effects than chemotherapy, and are frequently used in advanced NSCLC. There are three main targets:

1. Blood vessel growth
2. The epidermal growth factor receptor
3. The ALK gene.

New blood vessels are needed for tumours to grow. Angiogenesis inhibitors block new blood vessel formation and restrict tumour growth. One such inhibitor is **Avastin**<sup>®</sup> (bevacizumab) which targets vascular endothelial-derived growth factor (VEGF). VEGF is a protein inside the body that, in normal settings, helps new blood vessels to form. Avastin is given together with chemotherapy.

EGFR is a cell-surface protein that, normally, facilitates cell growth and division. In some types of NSCLC, tumour cells have too much EGFR and grow especially rapidly. **Tarceva**<sup>®</sup> (Erlotinib) is a medicine that blocks growth signals from EGFR.

A very small number of NSCLC tumours (about 5%) have a mutation in a gene called ALK. This mutation is usually found in non-smokers (or occasional smokers) with NSCLC adenocarcinoma. The mutation leads to an irregularity in the ALK protein, which makes the tumour cells grow and spread. A drug that blocks the irregular ALK protein (i.e. crizotinib [Xalkori<sup>®</sup>] capsules)\* is available in New Zealand for the patients who have this rare form of lung cancer.

\* Xalkori is a registered product of Pfizer New Zealand.

## *References*

1. Ministry of Health. Cancer: New registrations and deaths 2011. Available at: <http://www.health.govt.nz/system/files/documents/publications/cancer-new-registrations-deaths-2011-v4sept14.pdf> Accessed 11 April 2015.



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## *Avastin Consumer Panel*

Avastin<sup>®</sup> (bevacizumab), 100 mg/4mL and 400 mg/16 mL vials, is a **Prescription Medicine** used to treat metastatic (spreading) colorectal, kidney, breast, brain, lung and ovarian cancers.

**Do not use Avastin if:** you have had an allergic reaction to Avastin, any of its ingredients or other antibodies, or if you have been coughing or spitting up blood.

**Tell your doctor if:** you are pregnant or breast-feeding, or plan to become pregnant or breast-feed; you have any other health problems, especially the following: inflammation of the bowel or stomach ulcers, high blood pressure, a history of blood clots or stroke, bleeding problems, bleeding in the lungs or coughing or spitting up blood, low white blood cell counts, you have/ had a fistula, or have a history of diabetes; you have had major surgery in the last 28 days or a wound that has not healed properly; you have had a blocked lung artery (pulmonary embolism); you have heart disease; you have received anthracyclines (e.g. doxorubicin) for cancer, or radiotherapy to your chest; you are 65 years of age or older, or you are taking any other medicines.

**Tell your doctor immediately or go to your nearest Accident and Emergency Centre if you notice any of the following:** severe body or stomach pain or cramps; severe headache; severe diarrhoea, nausea and vomiting; coughing or spitting up blood; blood clots in the veins of the legs; pain and/or swelling in the lower legs, feet or hands; severe bleeding or problems with your wounds healing after surgery; seizures; confusion; sleepiness/drowsiness or fainting; abscesses (pus-filled sores); severe infection with high fever, chills, headache, confusion and rapid breathing; feeling of numbness or tingling in feet or hands; dry mouth with thirst and/or darkened urine; increased heart rate; shortness of breath; symptoms of an allergic reaction which may include shortness of breath, wheezing or difficulty breathing, swelling of the face, lips, tongue or other parts of the body, or rash, itching or hives on the skin. **Possible common side-effects may also include:** high blood pressure (symptoms include, headache, dizziness, ringing in the ears, tiredness, blurred vision); body pain, tiredness/ weakness; diarrhoea, constipation or rectal bleeding; sore mouth or mouth ulcers; loss of appetite, being thirsty; shortness of breath; runny, blocked or bleeding nose; dry, scaling or inflamed skin, change in skin colour; taste changes; blurred vision or other eye problems; dizziness; headache; frequent infections with symptoms such as fever, chills or sore throat; changes in your voice or difficulty speaking.

Avastin has risks and benefits. Ask your oncologist if Avastin is right for you. Use strictly as directed. If symptoms continue or you have side effects, see your healthcare professional. For further information on Avastin, please talk to your health professional or visit [www.medsafe.govt.nz](http://www.medsafe.govt.nz) for Avastin Consumer Medicine Information.

**Avastin is not funded by PHARMAC. You will need to pay the full cost of this medicine. A prescription charge and normal oncologist fees may apply.**

Consumer panel dated 03 November 2014 based on CMI dated 07 October 2014.

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## *Tarceva Consumer Panel*

Tarceva® (erlotinib), 150mg, 100mg and 25mg tablets, is a **Prescription Medicine** used for the treatment of advanced or metastatic (spreading) non-small-cell lung cancer (NSCLC). Tarceva can be given as initial therapy if your cancer has specific mutations in a protein called epidermal growth factor receptor (EGFR). It can also be given after previous treatment with chemotherapy.

**Do not use Tarceva if:** you are allergic to erlotinib or any ingredients in Tarceva.

**Tell your doctor if:** you are pregnant or breast-feeding, or plan to become pregnant or breast-feed, you have liver or kidney problems, you have had stomach ulcers or inflammation of the bowel wall, you are a smoker, you cannot tolerate lactose, or you are taking any other medicines.

**Tell your doctor immediately or go to your nearest Accident and Emergency Centre if you notice any of the following:** sudden onset of shortness of breath or difficulty breathing with cough and/or fever; severe or persistent diarrhoea, nausea or vomiting; severe stomach pain or discomfort; vomiting blood or bleeding from your back passage; tongue and/or facial swelling; hives or wheezing; blisters on the skin, especially in the nose, eyes and mouth; red or purple rash that spreads, accompanied by fever and chills, aching muscles and generally feeling unwell; yellowing of the skin and eyes or dark coloured urine. **Serious side effects may include:** infection with fever or chills; mouth irritation, sore mouth, mouth ulcers or cold sores; persistent cough. **Possible common side effects may also include:** diarrhoea; loss of appetite or weight loss; nausea or vomiting; dehydration; stomach pain or discomfort or belching after eating; difficulty in breathing; tiredness; rash; itching; dry skin; acne; tear in the skin; folliculitis (infection of hair follicles); unusual hair loss or thinning; eye irritation, inflammation or infection; nose bleeds; infection of nail bed or swelling around the nails; headache; fever; rigors or shaking; depression; or numbness or weakness of the arms and legs.

Tarceva has risks and benefits. Ask your doctor if Tarceva is right for you. Use strictly as directed. If symptoms continue or you have side effects, see your healthcare professional. For further information on Tarceva, please talk to your health professional or visit [www.medsafe.govt.nz](http://www.medsafe.govt.nz) for Tarceva Consumer Medicine Information.

**Tarceva (150mg and 100mg tablets) is a funded medicine for patients with NSCLC who meet pre- defined criteria. A prescription charge and normal doctor's fees apply.**

Consumer panel dated 03 November 2014 based on CMI dated 24 October 2014.

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