

Lung abscess

Synonyms: pyogenic lung infection/pneumonia, necrotising pneumonia

What is a lung abscess?^[1]

Lung abscess is a type of liquefactive necrosis of the lung tissue and formation of cavities (more than 2 cm) containing necrotic debris or fluid caused by microbial infection. It can be caused by aspiration, which may occur during altered consciousness and it usually causes a pus-filled cavity.

The process is usually surrounded by a fibrous reaction, forming the abscess wall. Multiple small abscess formations may occur - sometimes referred to as necrotising pneumonia.

Lung abscess is considered primary (60%) when it results from existing lung parenchymal process and is termed secondary when it complicates another process, eg, vascular emboli or rupture of extrapulmonary abscess into lung.

The most frequent cause is aspiration of anaerobic organisms from the mouth in those predisposed to [aspiration pneumonia](#), with [immunodeficiency](#) and cough reflex. A [pneumonitis](#) develops which progresses to abscess formation over a period of days or weeks.

Precipitating mechanisms^[1]

These include:

- [Inhalation of a foreign body](#).
- Bacteraemia seeding in the lungs.
- Tricuspid [endocarditis](#) leading to septic pulmonary embolus.
- Extension of [hepatic abscess](#).

- Association with [lung cancer](#).
- Proximal to bronchial obstruction.
- Complication of severe or incompletely treated [pneumonia](#) (particularly staphylococci or klebsiellae).
- Penetrating pulmonary trauma - eg, a stab wound.^[2]

NB: lung abscesses may present acutely or more chronically.^[1]

Types of lung abscesses

- Primary abscess - occurs in previously normal lungs and may follow aspiration.
- Secondary abscess - occurs in patients with an underlying lung abnormality.

Causes of a lung abscess (causative organisms)

In the pre antibiotic era, lung abscess was caused by one type of bacteria, and today almost in all cases it is caused by polymicrobial flora.^[1]

Common pathogens causing lung abscess include anaerobes, *Staphylococcus aureus* and enteric Gram-negative rods like *Klebsiella pneumoniae*.^[3]

Anaerobes

- *Peptostreptococcus* spp.
- *Bacteroides* spp.
- *Fusobacterium* spp.
- Microaerophilic streptococci.

Aerobes

- *S. aureus*.
- *Streptococcus pyogenes*.
- *Haemophilus influenzae*.

- *Pseudomonas aeruginosa*.
- *K. pneumoniae* - becoming more prevalent. [4]
- *Burkholderia cepacia* - particularly associated with cystic fibrosis.
- *Streptococcus pneumoniae*.
- Legionella pneumonia. [5]
- *Actinomyces* spp.
- *Nocardia* spp.
- *Proteus mirabilis*.
- *Pasteurella multocida* - zoonotic infection from cats/dogs/cattle. [6]
- *Burkholderia pseudomallei* - a soil-borne Gram-negative infection which causes a condition called melioidosis. It affects animals and humans, especially in Southeast Asia and northern Australia. [7]

Other organisms

- Mycobacterial infections - predominantly tuberculosis (TB).
- [Fungal lung infections](#), such as *Aspergillus*, *Cryptococcus*, *Histoplasma*, *Blastomyces*, *Coccidioides* species.
- Parasites, such as *Entamoeba histolytica*, *Paragonimus* spp.

How common is a lung abscess? (epidemiology) [1]

Incidence and prevalence figures have not been established.

Risk factors

- Alcoholism or drug misuse. Alcoholism is the most common condition predisposing to lung abscesses.
- Poor dental hygiene.
- Following general anaesthesia.
- Diabetes mellitus.

- Severe periodontal disease.
- Stroke/cerebral palsy/cognitive impairment/impaired consciousness leading to increased risk of aspiration.
- Immunosuppression, particularly chronic granulomatous disease in children.
- Congenital heart disease.
- Chronic lung disease, particularly cystic fibrosis.

Symptoms of a lung abscess (presentation)^[1]

Symptoms

- Onset of symptoms is often insidious (more acute if following pneumonia).
- Spiking temperature with rigors and night sweats.
- Cough ± phlegm production (frequently foul-tasting and foul-smelling and often blood-stained).
- Pleuritic chest pain.
- Breathlessness.

Signs

- Tachypnoea.
- Tachycardia.
- Finger clubbing in chronic cases.
- Dehydration.
- High temperature.
- Localised dullness to percussion (if consolidation is also present or effusion).
- Bronchial breathing and/or crepitations (if consolidation is present).
- Also look for signs of severe periodontal disease and [infective endocarditis](#).

Differential diagnosis

- Other causes of chest infection or pneumonia – eg, TB and opportunistic mycobacteria.
- Neoplasia – eg, cavitating bronchial carcinoma.
- Pulmonary infarction or pulmonary embolism.
- Vasculitis – eg, granulomatosis with polyangiitis.
- Sarcoidosis with cavities.
- Infected bronchogenic cyst.

Investigations

- FBC – normocytic anaemia or neutrophilia.
- Renal function.
- LFTs.
- Blood cultures and sputum cultures (including AAFB).
- ESR/CRP usually elevated.
- CXR – shows walled cavity, usually with a fluid level; may also be presence of an empyema or effusion.
- Tapping or draining of fluid or empyema with microbiology and cytology of samples.
- CT scan of the thorax – may detect multiple small abscesses.
- Fibre-optic bronchoscopy can exclude obstruction and provide samples for culture.
- Trans-thoracic biopsy/aspiration (usually with ultrasound guidance) or trans-tracheal biopsy.

Management of a lung abscess^[1]

Broad spectrum antibiotic to cover mixed flora is the mainstay of treatment. Pulmonary physiotherapy and postural drainage are also important. Surgical procedures are required in selective patients for drainage or pulmonary resection.

Supportive measures

- Analgesia.
- Oxygen if required.
- Rehydration if indicated.
- Postural drainage with chest physiotherapy.

Antibiotics

Most lung abscesses (80–90%) are now successfully treated with antibiotics.^[8]

- Begin with intravenous treatment, usually for about 2–3 weeks, and follow with oral antibiotics for a further 4–8 weeks.
- Recommended first-line therapy includes beta-lactam/beta-lactamase inhibitor or cephalosporin (second- or third-generation) plus clindamycin.^[9]
- 15–20% of anaerobic bacteria are resistant to penicillin only, so a combination of penicillin and clavulanate or a combination of penicillin and metronidazole should be considered as alternatives.^[1]
- Regimen should be altered once the organism is known.

Surgery

- If the condition fails to resolve with conservative measures, drainage via a bronchoscope, CT-guided percutaneous drainage or cardiothoracic surgical intervention may be required.^[10]
- Surgery is associated with a number of complications, such as empyema and bronchoalveolar air leak – especially so in children.
^[11] ^[12]

Where slow resolution occurs, the possibility of malignancy or unusual organisms must be considered.

Complications of a lung abscess

These include:^[1]

- Empyema.
- Pneumatocele.
- Bronchopleural fistula.
- Sepsis.
- Distant complications from haematogenous spread (eg, brain abscess).

Prognosis

- There is an overall 90% cure rate with antibiotic therapy.^[13]
- Morbidity and mortality are more likely to be associated with underlying pathology such as bronchial carcinoma.
- Prognosis is adversely affected by older age and multiple comorbidities.^[14]
- Other poor prognostic factors include pneumonia, reduced level of consciousness, anaemia and infection with *P. aeruginosa*, *S. aureus* and *K. pneumoniae*.^[15]

Further reading

- [Mohapatra MM, Rajaram M, Mallick A](#); Clinical, Radiological and Bacteriological Profile of Lung Abscess - An Observational Hospital Based Study. Open Access Maced J Med Sci. 2018 Sep 23;6(9):1642-1646. doi: 10.3889/oamjms.2018.374. eCollection 2018 Sep 25.
- [Wojsyk-Banaszak I, Krenke K, Jonczyk-Potoczna K, et al](#); Long-term sequelae after lung abscess in children - Two tertiary centers' experience. J Infect Chemother. 2018 May;24(5):376-382. doi: 10.1016/j.jiac.2017.12.020. Epub 2018 Feb 15.

- [Redding GJ, Carter ER](#); Chronic Suppurative Lung Disease in Children: Definition and Spectrum of Disease. *Front Pediatr.* 2017 Feb 27;5:30. doi: 10.3389/fped.2017.00030. eCollection 2017.

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