TABLE 154-1 EXAMPLES OF MICROBIAL PATHOGENS THAT CAN CAUSE LUNG ABSCESSES

Clinical Condition	Pathogens
Primary lung abscess (usually with risk factors for aspiration)	Anaerobes (e.g., *Peptostreptococcus* spp., *Prevotella* spp., *Bacteroides* spp., *Streptococcus milleri*), microaerophilic streptococci
Secondary lung abscess (often with underlying immunocompromise)	*Staphylococcus aureus*, gram-negative rods (e.g., *Pseudomonas aeruginosa*, Enterobacteriaceae), *Nocardia* spp., *Aspergillus* spp., Mucorales, *Cryptococcus* spp., *Legionella* spp., *Rhodococcus equi*, *Pneumocystis jirovecii*
Embolic lesions	*Staphylococcus aureus* (often from endocarditis), *Fusobacterium necrophorum* (Lemierre's disease; see text for details)
Endemic infections (with or without underlying immunocompromise)	*Mycobacterium tuberculosis* (as well as *Mycobacterium avium* and *Mycobacterium kansasii*), *Coccidioides* spp., *Histoplasma capsulatum*, *Blastomyces* spp., parasites (e.g., *Entamoeba histolytica*, *Paragonimus westermani*, *Strongyloides stercoralis*)
Miscellaneous conditions	Bacterial pathogen (often *S. aureus*) after influenza or other viral infection, *Actinomyces* spp.

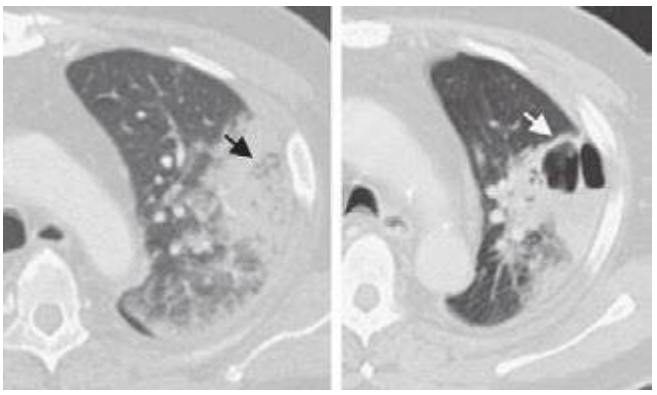
the same time significantly reduced the incidence of and mortality rate from lung abscess.

PATHOGENESIS

Primary Lung Abscesses The development of primary lung abscesses is thought to originate when chiefly anaerobic bacteria (as well as microaerophilic streptococci) in the gingival crevices are aspirated into the lung parenchyma in a susceptible host (Table 154-1). Thus, patients who develop primary lung abscesses usually carry an overwhelming burden of aspirated material or are unable to clear the bacterial load. Pneumonitis develops initially (exacerbated in part by tissue damage caused by gastric acid); then, over a period of 7–14 days, the anaerobic bacteria produce parenchymal necrosis and cavitation whose extent depends on the host–pathogen interaction (Fig. 154-1). Anaerobes are thought to produce more extensive tissue necrosis in polymicrobial infections in which virulence factors of the various bacteria can act synergistically to cause more significant tissue destruction.

Secondary Lung Abscesses The pathogenesis of secondary abscesses depends on the predisposing factor. For example, in cases of bronchial obstruction from malignancy or a foreign body, the obstructing lesion prevents clearance of oropharyngeal secretions, leading to abscess development. With underlying systemic conditions (e.g., immunosuppression after bone marrow or solid organ transplantation), impaired host defense mechanisms lead to increased susceptibility to development of lung abscesses caused by a broad range of pathogens, including opportunistic organisms (Table 154-1).

Lung abscesses also arise from septic emboli, either in tricuspid valve endocarditis (often involving *Staphylococcus aureus*) or in Lemierre's syndrome, in which an infection begins in the pharynx (classically involving *Fusobacterium necrophorum*) and then spreads to the neck and the carotid sheath (which contains the jugular vein) to cause septic thrombophlebitis.



A ***B***

FIGURE 154-1 Representative chest CT scans demonstrating development of lung abscesses. This patient was immunocompromised due to underlying lymphoma and developed severe *Pseudomonas aeruginosa* pneumonia, as represented by a left lung infiltrate with concern for central regions of necrosis (*panel* ***A,*** *black arrow*). Two weeks later, areas of cavitation with air fluid levels were visible in this region and were consistent with the development of lung abscesses (*panel* ***B,*** *white arrow*). *(Images provided by Dr. Ritu Gill, Division of Chest Radiology, Brigham and Women's Hospital, Boston.)*

PATHOLOGY AND MICROBIOLOGY

Primary Lung Abscesses In primary lung abscesses, the dependent segments (posterior upper lobes and superior lower lobes) are the most common locations, given the predisposition of aspirated materials to be deposited in these areas. Generally, the right lung is affected more commonly than the left because the right mainstem bronchus is less angulated. In secondary abscesses, the location of the abscess may vary with the underlying cause.

The microbiology of primary lung abscesses is often polymicrobial, primarily including anaerobic organisms as well as microaerophilic streptococci (Table 154-1). The retrieval and culture of anaerobes can be complicated by the contamination of samples with microbes from the oral cavity, the need for expeditious transport of the cultures to the laboratory, the need for early plating with special culture techniques, the prolonged time required for culture growth, and the need for collection of specimens prior to administration of antibiotics. When attention is paid to these factors, rates of recovery of specific isolates have been reported to be as high as 78%.

Because it is not clear that knowing the identity of the causative anaerobic isolate alters the response to treatment of a primary lung abscess, practice has shifted away from the use of specialized techniques to obtain material for culture, such as transtracheal aspiration and bronchoalveolar lavage with protected brush specimens that allow recovery of culture material while avoiding contamination from the oral cavity. When no pathogen is isolated from a primary lung abscess (which is the case as often as 40% of the time), the abscess is termed a *nonspecific lung abscess*, and the presence of anaerobes is often presumed. A *putrid lung abscess* refers to foul-smelling breath, sputum, or empyema and is essentially diagnostic of an anaerobic lung abscess.

Secondary Lung Abscesses In contrast, the microbiology of secondary lung abscesses can encompass quite a broad bacterial spectrum, with infection by *Pseudomonas aeruginosa* and other gram-negative rods most common. In addition, a broad array of pathogens can be identified in patients from certain endemic areas and in specific clinical scenarios (e.g., a significant incidence of fungal infections among immunosuppressed patients following bone marrow or solid organ transplantation). Because immunocompromised hosts and patients without the classic presentation of a primary lung abscess can be infected with a wide array of unusual organisms (Table 154-1), it is of special importance to obtain culture material in order to target therapy.

CLINICAL MANIFESTATIONS

Clinical manifestations may initially be similar to those of pneumonia, with fevers, cough, sputum production, and chest pain; a more chronic and indolent presentation that includes night sweats, fatigue, and anemia is often observed with anaerobic lung abscesses. A subset of patients with putrid lung abscesses may report discolored phlegm and foul-tasting or foul-smelling sputum. Patients with lung abscesses due to non-anaerobic organisms, such as *S. aureus*, may present with a more fulminant course characterized by high fevers and rapid progression.

Findings on physical examination may include fevers, poor dentition, and/or gingival disease as well as amphoric and/or cavernous breath sounds on lung auscultation. Additional findings may include digital clubbing and the absence of a gag reflex.