THE ROLE OF MYCOPLASMA PNEUMONIAE IN PLEUROPULMONARY INFECTIONS

Thesis

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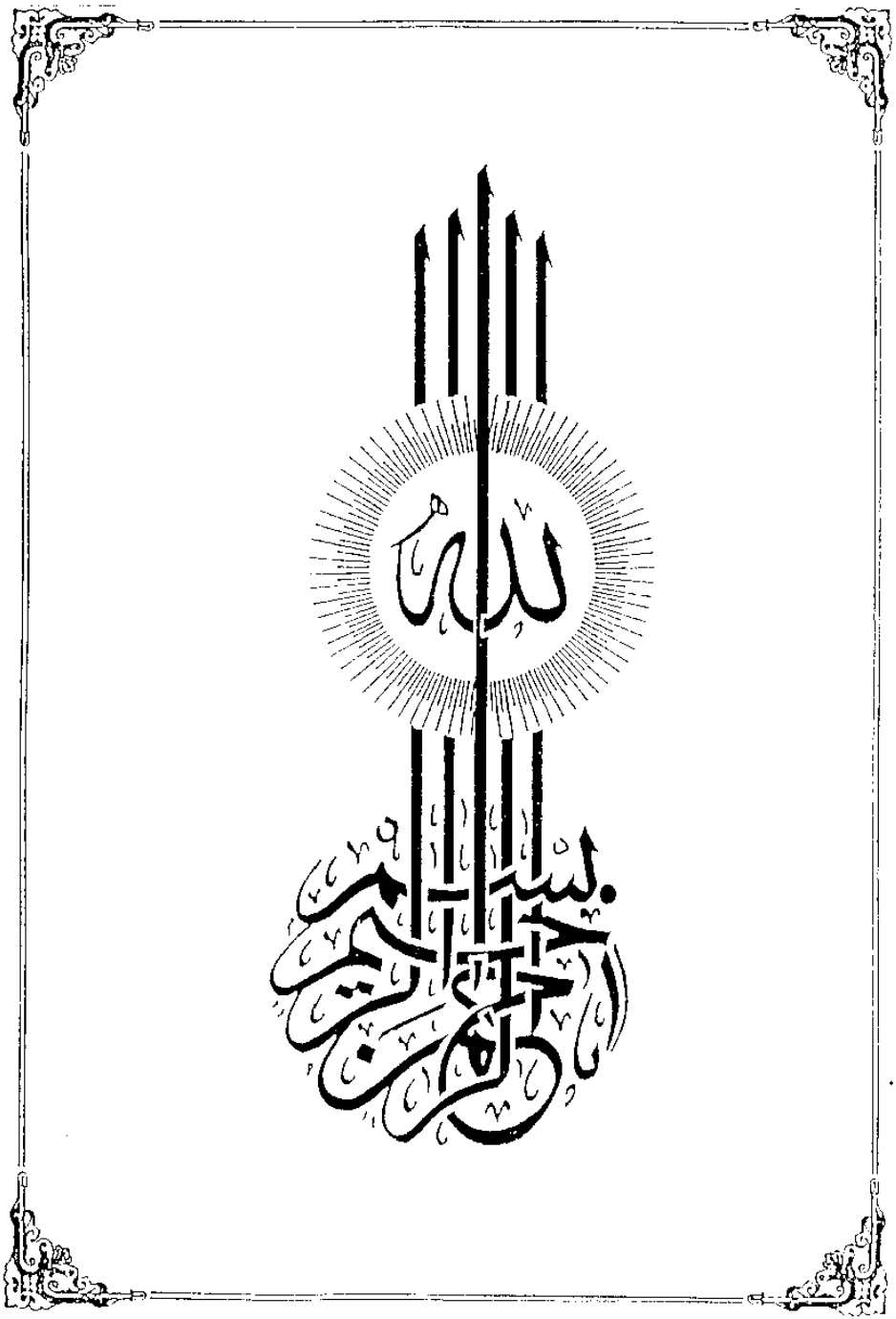
بسم الله الرحمن الرحيم

«وعلَّمَكَ مَا لَمْ تَكُنْ تَعْلَمُ
وكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيماً »

صدق الله العظيم

سورة النساء آية (١١٣)



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INTRODUCTION AND AIM OF WORK

INTRODUCTION

Respiratory tract infections are responsible for 6 to 24 percent of all causes of death in different populations (Macfarlane et al., 1982). The commonest respiratory infections are acute tracheobronchitis, acute exacerbations of chronic bronhitis and the pneumonias. Pleural effusion, empyema, meningitis, pericarditis,endocarditis and bacteremia are very serious complications associated with an increased mortality rate. Some forms of pneumonias may progress to respiratory failure (Joklik et al., 1984).

Community-acquired pneumonia remains a common reason for admission of patients to hospital and an important cause of morbidity and mortality (Macfarlane et al., 1982). Hospital-acquired pneumonias are considered as the third most common nosocomial infection, after urinary tract infections and wound infections. Pneumonias are involved in 5% of all hospital admissions. In the intensive care units, it is a serious problem, with an incidence of nearly 60% of all patients admitted to critical care areas and a mortality of 50% of cases. In patients who have the adult respiratory distress syndrome, the mortality with associated pneumonia is nearly 70% (Meden et al., 1985).

Different pathogens are involved as causative agents of such pulmonary infections. *Streptococcus pneumoniae* and *Haemophilus influenzae* are the most commonly isolated organisms. There are other agents that may cause primary infection in the respiratory tract or lung. These include *Mycoplasma pneumoniae, legionella pneumophila, chlamydia psittaci* and *Coxiella burneti* (Collee et al., 1989). Pulmonary

tuberculosis is a destructive lung disease which still ranks as a major cause of undiagnosed febrile pulmonary disease (Goodwin, 1971). ***Legionella pneumophila*** is relatively uncommon. It accounts only for 1-2% of community-acquired pneumonia (Andrews et al., 1987) and for 1-4% of atypical pneumonia admitted to hospitals (Walder et al., 1981).

Pulmonary infection with ***Mycoplasma pneumoniae*** is relatively common and account for up to 20% of all diagnosed cases of pneumonia in the general population (Cassell and Cole, 1981). It causes illness ranging from mild upper respiratory symptoms to severe pneumonia, respiratory failure and occasionally death (Murray et al., 1975). A high mortality rate of ***M. pneumoniae*** infections (5%) equal to that of pneumococcal pneumonia have been reported (Andrews et al., 1987). ***M. pneumoniae*** infection may cause severe pulmonary complications, including pleural effusions, multilobe distribution, abscess formation and respiratory failure (Cassell and Cole, 1981). Extrapulmonary complications of ***Mycoplasma pneumoniae*** are well known. These include auto immune haemolytic anaemia, disseminated intravascular coagulation (Pickens and Catteral, 1978); central and peripheral nervous system disease (Cotter et al., 1983); hepatitis (Murray et al., 1975); myo-and pericarditis (Cassell and Cole, 1981); arthritis (Taylor-Robinson et al., 1978) and erythema multiforme (McCormack, 1981). Pulmonary infections with ***Mycoplasma pneumoniae*** are thus very hazardous and rather confusing disease process. Accordingly, it is very important to rapidly diagnose such infections in order to choose and administer the adequate antibiotic. Different specimens (sputum, bronchoalveolar lavage, and percutaneous

needle aspirate) and available techniques should be evaluated to determine the most rapid, reliable and effective diagnostic procedure.

Aim of Work:

This work is directed to fulfil the following:

1. Searching for ***Mycoplasma pneumoniae*** among different causative bacterial agents of pleuropulmonary infections.
2. Evaluating the different diagnostic procedures with respect to rapidity and reliability.

REVIEW OF LITERATURE

RESPIRATORY TRACT INFECTIONS

Infections of the respiratory tract are among the most common afflictions of mankind. These infections may involve the trachea and bronchial tree (tracheitis, bronchitis and bronchiolitis); and the lung tissue (alveolitis and pneumonia) (Koneman et al., 1992). The consolidating infections of the lung (pneumonias) accounts for 15 per cent of hospital-acquired infections. It is associated with mortalities ranging from 20 to 50 percent and is the most common fatal nosocomial infection (Graybill et al., 1973). Community-acquired pneumonia remains a common cause of admission to hospital (Macfarlane et al., 1982). The aetiology of respiratory diseases very with age, season, the type of population at risk and other factors (Collee and Watt, 1990). Most of the causative pathogens are viruses which cause considerable morbidity and socioeconomic loss but very little mortality. The common viruses isolated from patients with acute respiratory illness include rhinoviruses, parainfluenza, adeno and respiratory syncytial viruses (Monto and Ullman, 1974). A wide range of bacteria are concerned in respiratory tract infection including *Streptococcus pneumoniae, Haemophilus spp.,* group A haemolytic streptococci, *Branhamella catarrhalis, Staphylococcus aureus, legionella spp., pseudomonas aeruginosa* and *klebsiella spp.* These organisms may occur either as primary causes of acute illness such as pneumococcal pneumonia and Legionnaire's disease or as secondary invaders of lung damaged by viral or other agencies or where the defenses are impaired by circumstances such as old age, cardiac disease or steroid therapy (Collee and Watt, 1990). There are other agents that may cause primary infection of the respiratory tract, these include

Mycoplasma pneumoniae, chlamydia psittaci and *Coxiella burneti* (Collee et al., 1989). Anaerobic bacteria are important causes of lung abscess, necrotizing pneumonia, and empyema (Bartlett and Finegold, 1972) pathogenic mycobacteria as well as pathogenic fungi are also involved as causes of respiratory tract infection. Tuberculosis is a disease which caused more suffering and death than any other bacterial infection and it is still a major health problem in most counteries of the world (Grange, 1990).

Infection of the pleura and pleural cavity may arise by extension from an infected segment of lung, or by lymphatic or haematogenous spread. Infection by direct extension may occur as a complication of pneumonia or lung abscess. A liver abscess or subdiaphragmatic infection may track upwards into the pleural space. Infection also may occur by transthoracic entery from trauma, surgery, or manipulative procedures (Bryant, 1990). Infection of the pleura may be localized without fluid, while a more generalized infection may give rise to serous effusion or to a purulent effusion (empyema) (Collee and Watt, 1990). Inflammatory exudate may become loculated in a relatively small area or may extend to involve virtually the entire hemithorax, leading to ventilatory dysfunction and to signs and symptoms of overwhelming sepsis and multiple organ failure (Bryant, 1990). According to Andrews and his Coworkers (1963), the phases of empyema formation are divided into the exudate phase, during which leukocytes increase untill pus is formed; the fibropurulent phase, during which fibrin formation begins to limit expansion of the lung; and the organizing phase, during which fibroblast formation and scarring produce a thick, leathery encasement that traps the lung.

The organisms associated with pleurisy and pleural effusion include ***staphylococcus aureus***, various coliform bacteria, and anaerobic bacteria such as ***Bacteroides spp.*** often in mixed infection with anaerobic or microaerophilic cocci (Collee and Watt, 1990). Anaerobic pleuropulmonary infection is usually associated with aspiration pneumonia, necrotizing pneumonia, lung abscess and empyema (Bartlett and Finegold, 1972).

Bacterial infection of the respiratory tract occurs as a result of the interaction of several factors in the host and in the microbial pathogen. A number of factors are known to interfere with normal host defenses and to predispose to infection. Alterations in the level of consciousness from any cause(Stroke, drug intoxication, anaesthesia, alcohol abuse) can compromise epiglottic closure and lead to aspiration of oropharyngeal flora into the lower respiratory tract (Huxley et al., 1978). Cigarette smoke, perhaps the most common agent involved in compromising natural pulmonary defense mechanisms, disrupts both mucociliary function and macrophage activity (Green and Carolin, 1967). Other factors that impair pulmonary clearance of pathogens include hypoxemia, acidosis, alcohol, toxic inhalations, pulmonary oedema, uremia, malnutrition, corticosteroids, immunosuppressive agents, viral infection, and mechanical obstruction (Mandell et al., 1990).

Adults with pneumonia may have some other associated conditions such as diabetes mellitus (Ebright and Rytel, 1980). Polymorphonuclear phagocytes from patients with diabetes mellitus respond poorly to chemotactic stimuli, and the hyperosmolar states in diabetes also result