Antibiotics a boon to Lower Respiratory Tract Infections (LRTIs) - A Review

Shidhin Babu K.S*, K. Krishnakumar, L. Panayappan, Meppil Baby*

Department of pharmacy practice, St James College of Pharmaceutical Sciences, Chalakudy, Kerala
St James Hospital Trust Pharmaceutical Research Centre, Chalakudy, Kerala

Corresponding Author Email: stjamesdruginfo@gmail.com

Received 06 July 2015; accepted 04 August 2015

Abstract
Lower respiratory tract infections (LRTIs) include acute bronchitis, bronchiolitis, pneumonia and Lung abscess. Antibiotics are commonly prescribed for LRTIs in adults and children in primary care. Antibiotics alone may not help to treat many of the lower respiratory infections which are caused by viruses. Acute bronchitis often does not require any antibiotic therapy, whereas antibiotics can be given to patients with acute exacerbations of chronic bronchitis. For the initial oral chemotherapy of bacterial infections of the lower respiratory tract (chronic bronchitis, pneumonia) the effective and well tolerated cephalosporins, macrolides and amoxicillin plus beta-lactamase-inhibitor are recommended. Quinolones are recommended for more complicated cases with severe underlying diseases, longer history or frequent exacerbations. Antibiotics are the first line of treatment for pneumonia but are not recommended for viral infections.

INTRODUCTION
An acute illness which usually occurs for 21 days or less, associated with cough as the main symptom, with at least one other lower respiratory tract symptoms such as sputum production, dyspnoea, wheeze or chest discomfort/pain[1]. Lower respiratory tract infections is often referred to as pneumonia, it can also be applied to other types of infections including lung abscess and acute bronchitis. Symptoms include shortness of breath, weakness, fever, cough and fatigue[2]. There are number of infections that can affect the lower respiratory tract. The most common are bronchitis and pneumonia[3].

Lower Respiratory Tract Infections:
Bronchitis:
Bronchitis can be classified as either acute or chronic. Acute bronchitis may be defined as acute bacterial or viral infection of the larger airways in healthy patients with no history of recurrent disease [4]. It is characterized by a persistent cough and occasionally fever and chest pain. It is self-limiting and generally last for 7-14 days[5]. Routine antibiotic use is not indicated in healthy patients with cough and purulent sputum as it may lead to development of resistant strains. Most often it is caused by viral infection and hence antibiotic therapy is not recommended[6][7]. If the illness is severe or persists longer than seven days, then it might be due to bacterial infection. Acute Exacerbations of Chronic Bronchitis (AECB) are frequently due to non-infective causes along with viral ones. It has a multifactorial aetiology including a viral, bacterial, allergic or environmental pollutant as possible causes[8]. 50% of patients are colonized with Haemophilus influenza, Streptococcus pneumonia or Moraxella catarrhalis. Antibiotics are effective only if three of the following symptoms are present: increased dyspnoea, increased sputum volume and purulence[9]. Antibiotics may benefit only to certain patients that are not yet well characterized. Antibiotics do not benefit milder exacerbations involving...
only one of these symptoms.

**Community acquired Pneumonia (CAP):**
Pneumonia may be caused due to variety of situations and treatment must vary accordingly.[10] It is classified as either community or hospital acquired depending on where the patient contracted the infection. It is life threatening in the elderly.[11],[12]. The most common treatment is with antibiotics, but choice of antibiotics may vary in their adverse effects and their effectiveness.[13]. Pneumonia is also a leading cause of death in children less than 5 years of age.[14]. The most common cause of pneumonia is *pneumococcal bacteria*, *streptococcus pneumonia* which accounts for 2/3 of bacteremic pneumonia.[15]. Antibiotic therapy should be commenced immediately without waiting for culture results and it should cover treatment for streptococcus pneumonia, which is the most common cause of CAP.

**TREATMENT:**
An important consideration in the treatment of a patient with lower respiratory tract infection is to decide the requirement of antibiotics. Many infections are viral and only symptomatic treatment is required. The choice of drug will depend on the site of infection, severity of illness, the age of the patient, presence of an underlying disease, history of drug reactions and compliance of the patients.[10]

**Choice of antibiotics:**
Patients are grouped according to their risk factors. Group 1 includes younger patients with mild infection. They can be treated with a drug which is effective against both *Streptococcus pneumonia* and *Mycoplasma pneumonia*. The macrolides (erythromycin, roxithromycin) or doxycyclines have the required spectrum for oral therapy.[17]. For moderate disease which requires parenteral therapy, intravenous penicillin is recommended in combination with a macrolide. The macrolides can be given orally in these patients. Group 2 includes older patients or those with pre-existing illnesses. As these patients are more likely to have infection with *Haemophilus influenza* as well as *Streptococcus pneumonia*, any antibiotic therapy should be aimed primarily against these organisms. Amoxicillin is suitable for oral therapy for most of the patients. Alternate drugs include doxycycline, amoxicillin/potassium clavulanate or cefuroxime.[18]. Penicillin can be given to those patients requiring parenteral therapy as it achieves adequate tissue concentrations to treat non-beta lactamase producing *Haemophilus influenza* as well as *Streptococcus pneumonia*. However in those patients where a beta lactamase-producing organism is causing the infection then therapy should be changed to a third generation cephalosporin such as ceftriaxone or cefotaxime.[19]. Group 4 patients require parenteral antibiotics that will cover all possible causes including *Legionella spp.* Initially, the first step is to treat the infection using third generation cephalosporin combined with intravenous erythromycin. Subgroups of patients with underlying disease such as bronchiectasis have an increased risk of *Pseudomonas aeruginosa* infection. Their therapy includes use of antipseudomonal beta lactum such as ceftazidime along with an aminoglycoside.[20]. Group 4 and group 5 patients usually have moderate to severe pneumonia requiring hospitalization and specialized care. The initial route of therapy will depend on the severity of illness, the ability of the patients to tolerate oral medication and of course patient compliance. The choice of drug should be made on known susceptibility if the causative organism has been identified. For those patients initially treated for severe pneumonia, a combination of an oral macrolide along with either amoxicillin/potassium clavulanate or cefuroxime would be suitable.[21]. The fluoroquinolones (ciprofloxacin and ofloxacin) have relatively poor activity against *Streptococcus pneumonia* which is a predominant LRTI pathogen and hence they have no place as single agents in blind treatment of LRTI.[22]. They are effective against *Haemophilus influenza* and *Mycoplasma pneumonia*. Tetracycline cannot be recommended for the routine treatment of LRTI. Co-trimoxazole is effective against both *Streptococcus pneumonia* and *Haemophilus influenza*, but is associated with lots of undesirable adverse effects such as blood and generalized skin disorders. Antibiotics have limited efficacy in treating a large proportion of LRTIs in adults and childrens. LRTI conditions are largely self-limiting and complications are likely to be rare if antibiotics are withheld. The inappropriate use of antibiotics has the potential to cause drug related adverse effects, increase the prevalence of antibiotic-resistant organisms in the community and also increase primary care consultation rates for minor illness.

**DURATION OF TREATMENT:**
The total length of treatment will depend on the clinical response, but is usually 5-10 days. For severe disease, therapy should be for 7-14 days, but prolonged therapy is recommended if complications such as empyema or abscess formation occur. Treatment for *Legionella* should be for at least 14 days.

**PREVENTION:**
Vaccination help prevent LRTIs, mostly against influenza viruses, adenoviruses, measles, rubella, streptococcus pneumonia, Haemophilus influenza, diphtheria and bacillus anthracis.

**IMPORTANT DRUG INTERACTION:**
A number of the newer antimicrobials may inhibit liver drug metabolism. The anticoagulant effect of warfarin may be enhanced by the macrolides, ciprofloxacin, and ofloxacin. Theophylline levels may be increased by the macrolides and ciprofloxacin. Hypoglycaemic effect of sulphonylurea is enhanced by ciprofloxacin, ofloxacin and co-trimoxazole. Carbamazepine blood levels are elevated by macrolides. Broad spectrum antibiotics may reduce the contraceptive efficacy of the combined oral contraceptive pill.

**CONCLUSION**
Acute exacerbation of chronic bronchitis and pneumonia are common illnesses in our community. Prescribing the appropriate antibiotic is important to obtain the optimal patient response. No offer or a delayed offer of antibiotics for acute uncomplicated lower respiratory tract infection is acceptable. Amoxicillin or tetracycline must be used as the
antibiotic of first choice based on wide experience in clinical practice. In the case of hypersensitivity a tetracycline or macrolide such as azithromycin, clarithromycin, erythromycin or roxithromycin is a good alternative. When more than one drug has to be taken, preference should be given to the drug with fewest side effects and lowest cost and one which the patient has compliance.

REFERENCES
1. Guidelines for the management of adult lower respiratory tract infections (LRTIs).

Source of support: Nil; Conflict of interest: None declared