# CHAPTER I

# INTRODUCTION

*Klebsiella pneumoniae* is one of the pathogenic bacteria that cause human nosocomial infections. It accounts for a significant proportion of hospital – acquired urinary tract infections, pneumonia, septicemia, and soft tissue infections. (1-2) The principle pathogenic reservoirs for transmission of *K. pneumoniae* are in the gastrointestinal tract and the hands of hospital personnel. (3) Because of their ability to spread rapidly in the hospital environment, the microorganism tends to cause nosocomial outbreaks. (4)

Almost all *K. pneumoniae* can produce β - lactamase enzyme that destroys β - lactam antibiotics such as penicillins and cephalosporins, thus the treatment does not work. The TEM and SHV enzymes are the most frequently observed among members of the family *Enterobacteriaceae.* Mutation in the gene encoding the TEM and SHV β - lactamase can extend the spectrum of the enzyme activity to the newer cephalosporins and monobactams. The enzymes called extended spectrum β – lactamase (ESBL) which are predominantly derivatives of TEM and SHV enzymes. Most of the organisms harboring ESBL are in the species of *Klebsiella*, especially *K. pneumoniae.* The isolation of the *Enterobacteriaceae* producing ESBL was began in 1982 for England and Argentina, in 1983 for Germany, in 1984 for Tunisia and France and in 1986 for the United States. (5-7) The incidence of ESBL producing

strains among clinical *Klebsiella* isolates has been steadily increasing over the past ten years. There are many reports about the source of ESBL producing *K. pneumoniae.* (8) The outbreak was spread within the hospital, and was frequently happened in intensive care unit, neonatal unit and burn unit where the cephalosporins or other broad spectrum agents were heavily utilized. (9-10) Most reports suggested that ESBL producing *K. pneumoniae* could be transmitted from medical personnel to patients, or from patients to patients. This causes limitations on the therapeutic options demand new measures for the management of *Klebsiella* hospital infections. There are many typing methods for the study of the epidemiology of ESBL producing *K. pneumoniae* include the use of antimicrobial susceptibility pattern (antibiogram), phage typing and molecular typing such as plasmid profile, ribotyping, polymerase chain reaction (PCR) and analysis of restricted fragments of chromosomal DNA by pulse–field gel electrophoresis (PFGE) which is the best typing method. (11)

At present, there has been very few reports concerning the ESBL producing *K. pneumoniae* detected in Thailand; the treatment failure due to the use of cephalosporins among *K. pneumoniae* infections had been reported. Thus, it is very interesting to detect such organism isolated from the clinical specimens and from the feces of the normal people. The detection of ESBL producing *K. pneumoniae* was performed using the initial screen test and the phenotypic confirmatory test according to the National Committee for Clinical Laboratory Standards. In addition, the pulsotyping of ESBL producing *K. pneumoniae* by PFGE would also be performed in order to determine the varieties of types of the organisms detected. As already

mentioned, ESBL producing *K. pneumoniae* is the nosocomial infection that caused the morbidity, mortality and perplexing problem for physicians in the treatment of this infection. It is also interesting to perform the antimicrobial susceptibility test for all ESBL producing *K. pneumoniae* isolates.

The results from this study would provide the informations on the prevalence and the distribution of pulsotypes of the ESBL producing *K. pneumoniae* as well as the current informations on the antimicrobial susceptibility of the organism. All the informations obtained should be benefit for the treatment of the patients who are infected with ESBL producing *K. pneumoniae* and also for medical personnel in the control and prevention of the occurrence of this organism.

# OBJECTIVES

The purpose of this study are :

1. To detect ESBL producing *K. pneumoniae* isolated from clinical specimens and feces from normal person by initial screen test and phenotypic confirmatory test.
2. To perform the antimicrobial susceptibility test of ESBL producing *K. pneumoniae.*
3. To perform the pulsotyping of ESBL producing *K. pneumoniae* using Pulsed - Field Gel Electrophoresis.