

**UNIVERSITI TEKNOLOGI MARA**

**CHANGES IN THE METABOLISM PATHWAY OF  
LIVER ORGAN INFECTED WITH  
*KLEBSIELLA PNEUMONIAE***

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## ABSTRACT

*Klebsiella pneumoniae* is one of the most common multidrug resistant bacteria. One of the reasons is increased number of extended-spectrum beta-lactamases produced by the bacteria. With metabolomics, new drug targets can be discovered to treat bacteria that are capable of multiple drug resistance enzymes. This study aims in profiling the changes in the metabolism of the *K. pneumoniae* infected liver organ using LC/MS-QTOF and to identify metabolism pathway involved in the infected liver organ. This study is done by using normal and *K.pneumoniae* infected liver organ of *Rattus norvegicus*. The organs were cut to get similar weight and solidified using liquid nitrogen. Then, the organs were grinded to turn them into powder. Several solvents were used to extract the sample; such as methanol, chloroform, acetonitrile and distilled water. The samples were injected into LC/MS-QTOF for analysis. MetPa; a web-based tool is used to analyze and visualize metabolic pathway. Based on the metabolic profiling and metabolic pathway analysis, liver organ infected with *K.pneumoniae* showed changes in two metabolic pathways which include retinol and arachidonic acid metabolism. The role of retinoic acid in retinol metabolism pathway in infection is to promote differentiation of T and B cells, thus induce immune tolerance while, leukotriene A4 is an intermediate of a potent chemotaxis. The presence of retinoic acid and leukotriene shows they may be involved in *K.pneumoniae* infection in liver organ. Therefore, validation is required so that it can be use as biomarker in *Klebsiella pneumoniae* diseases.

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# CHAPTER 1

## INTRODUCTION

### 1.1. BACKGROUND OF STUDY

Bacteria are organisms that can inhabit in many places. Some even can live in water with high temperature. It is not surprising that bacteria also live in human body and they are called the normal flora. These bacteria are 'good' bacteria because they aid human body to digest and absorb nutrients in the gastrointestinal tract especially the intestine. Medications are needed to kill or to prevent the growth of bacteria in order to prevent further derangement of the metabolism system of the hosts.

*Klebsiella pneumoniae* is one of the genus from Enterobacteriaceae family. In recent years, *K.pneumoniae* has become one of the most common bacteria causing multidrug resistant in hospital. In Asian countries, Gram negative bacilli (GNB) was reported to be the culprit of 13.0% of the infections found in hospitalised patients; among which *K.pneumoniae* was isolated in 6.3% of the cases and mainly from sputum. Another 2.0% (17) of the cases were bacteremia (Peto et al., 2014).

One of the reasons which caused the increase of bacterial resistance was the increased production of extended-spectrum beta-lactamases enzyme by the bacteria. There are three types of carbapenemases enzymes which are produced by