CHAPTER 1 INTRODUCTION

1.1 Background

Acute kidney injury (AKI) is a health problem affecting many hospital patients world-wide. AKI is a clinical problem estimated to occur in approximately 7% of all hospital patients [19]. AKI is characterized by a reduction in renal function over hours or days. The diagnosis of AKI is consistently associated with both long term and short term morbidity outcomes [20]. Normally, AKI is diagnosed by measuring serum creatinine levels, but there are disadvantages to using this method. The concentration of serum creatinine does not increase until a half of kidney function is lost, which may be too late to implement effective patient treatment. In addition, techniques to measure increases in serum creatinine levels do not provide sensitive and reliable results. Therefore, biomarkers are used as an indicator for AKI. There are a lot of biomarkers, but the most promising biomarker for prediction of AKI is NGAL or LCN2 [12]. NGAL protein can be successfully used to diagnose AKI in patients. This protein can be detectable in either plasma or urine. The level of NGAL responses to AKI in patients 1-3 days earlier than does serum creatinine. Thus NGAL is an early, potentially real-time biomarker [6].

The method which can be used tomeasure NGAL for diagnosing AKI is Immunoassays. The assays use the principle of antibodies to their antigens. There are several analytical methods available to measure NGAL, but they pose many problems including expensive measurement, inaccuracy, and long time analysis. First, the enzyme-linked immunosorbent assay (ELISA) is typically used in a well-based platform. In addition, ELISA provides precise and accurate results, but it is expensive and time consuming to be used in clinical practice. In addition, Alere's Triage device and Architect analyzer can be used for measurement of NGAL. Alere's Triage device is used for measurement of plasma NGAL. However, it has problems in the interpretation of results e.g. a high degree of variability. Architect analyzer is used for determination of NGAL in urine. In comparison, this method is more accurate and has better performance than Triage device, but it requires specialized equipment and high investment (at least $200,000). Another method is lateral flow chromatographic immunoassay. Lateral flow chromatographic immunoassay is a simple method for detection of NGAL which uses the same technique as the home pregnancy test. This technique shows the highest potential for rapid and economical detection.

Previously, researcher studied the lateral flow chromatographic immunoassay test strip using gold nanoparticles as a label for detection of NGAL. The results of this study showed that the color intensity of the test line was too pale for clear result interpretation. After that, another researcher tried to study the lateral flow chromatographic immunoassay test strip using carbon nanoparticles as a label for detection of NGAL. However, the results of this experiment showed that the color intensity of the test line was still too pale for clear result interpretation. Therefore, the cause of low intensity test line needs to be investigated.

In this study, the cause of low intensity test line was investigated. Firstly, by checking label performance and secondly, by checking the antibody activity.

1.2 Objectives

- To investigate the cause of low intensity test line by checking the label performance and the antibody activity.

1.3 Scope of work

- Nitrocellulose membrane was used as a reaction membrane platform.
- Carbon nanoparticles were used as a label and conjugated with monoclonal anti-NGAL antibodyand human lipocalin2 NGAL biotinylated antibody

Samples were used in this study is NGAL protein in phosphate buffer saline (PBS)