CHAPTER I

INTRODUCTION

1.1 Background

Antimicrobial resistance (AMR) continues to be a dynamic global concern as the improper use of antibiotics, has resulted in the increased emergence of multidrug-resistant (MDR) bacteria (Zheng *et al*., 2017). As the selective pressure imposed by the usage of antibiotics on resistant bacteria starts to grow, there is also an increased frequency in the transfer of resistant genes through horizontal gene transfer (HGT) (Broaders *et al*., 2013). MDR becomes a particularly serious issue in the context of probiotics – live microorganisms which when administered in adequate amounts confer a health benefit on the host (Hill *et al*., 2014). This is because the consumed probiotics may become hosts in transferring these AMR genes to the potential pathogenic bacteria residing in the human gastrointestinal tract; resulting in potentially untreatable infections (Kim *et al*., 2017). *Bifidobacterium* as well as *Lactobacillus* are considered as one of the most (Holzapfel, 2001). Therefore, the risk of HGT within these genera are of particular interest.

As a result of the challenges brought about by AMR, novel approaches are needed which could be used to combat it. Ethylenediaminetetraacetic acid (EDTA) is a potential strategy in increasing the inhibition effect of some antibiotics. Previous studies have reported the effect of its metal chelating ability on the function and expression of antibiotic resistance genes (Hinchliffe *et al*., 2017; Samantha & Vrielink, 2020). This research seeks to determine the susceptibility of *Bifidobacterium animalis* subsp. *lactis* BR2-5, a commonly used probiotic species

(Hill *et al*., 2017), to several groups of common antibiotics as well as the effect of metal deprivation on the antibiotic susceptibility of the isolate.

1.2 Problem statement

The spread of AMR among bacterial communities represents a major concern today. This is especially true in the case of microorganisms of the gut microbiota such as *Bifidobacterium* which is widely exploited by the food industry probiotics. As a result of its clear relevance to human health, the presence of AMR genes in probiotics and the potential risk of genetic transfer between microorganisms needs to be continuously investigated. Concurrently, exploring new strategies in order to combat AMR is also vital.

1.3 Aim & Objectives

1.3.1 General Aim

The general aim of this study is to evaluate the AMR of *Bifidobacterium animalis* subsp. *lactis* BR2-5 as well as study the effect of metal deprivation on its AMR.

1.3.2 Specific objectives

The specific aim are as follows:

1. Antimicrobial resistance analysis towards several groups of common antibiotics through disk diffusion test on *Bifidobacterium animalis* subsp. *lactis* BR2-5.
2. Analyze the effect of EDTA and metal deprivation on the antibiotic susceptibility of *Bifidobacterium animalis* subsp. *lactis* BR2-5.
3. Genomic analysis of *Bifidobacterium animalis* subsp. *lactis* BR2-5 to identify genes that contribute to antimicrobial resistance.