CHAPTER I

INTRODUCTION

Trace metals have been studied for their roles in cariogenesis [1]. Studies of trace metals in drinking water and tooth enamel have suggested a cariogenic potential for manganese [2,3]. Furthermore, a study using an animal model revealed that manganese added to drinking water resulted in a significant increase in caries levels [4]. Recent research has shown that manganese is required for growth and survival of many living microorganisms [5]. Requirements for manganese occur in both Gram-positive and Gram-negative bacteria for growth and metabolic activities [6-10]. Manganese is well known to function as a cofactor for some bacterial enzymes. The biological importance of Mn is not restricted to enzyme-mediated catalysis. Mn^{2+} is crucial for the proper function of a variety of bacterial products, including secreted antibiotics [8], and contributes to the stabilization of bacterial cell walls [11]. A few studies have shown that manganese can interact with transcriptional regulators in many bacteria [12-14]. Defects in the uptake of manganese have been shown to reduce the virulence of various species of bacteria [6,7]. Previous studies suggested that manganese was required for growth of mutans streptococci [15,16]. *Streptococcus mutans* is considered to be the main etiological species in caries disease. Its virulence depends on the ability to promote its colonization and survival in the oral biofilm, the dental plaque, which covers the tooth surfaces. Recognized virulence factors include the cell surface proteins, acid production, acid tolerance, and production of glucosyltransferases (GTFs) [17].

The aims of this study are: firstly to determine the effect of manganese on growth in *S. mutans* serotype c which is the most common serotype found in the human oral cavity; secondly, to determine the effect of manganese on the biofilm architecture in the presence and absence of sucrose; and lastly, to study the effect of manganese on the expression of *S. mutans* virulence genes. Information and knowledge gained from this study will contribute to understanding the mechanisms behind virulence gene regulation and the pathogenesis of *S. mutans*, which may in turn lead to effective methods for caries control.