CHAPTER I
INTRODUCTION

A dressing is an adjunct used by a person for application to a wound in order to promote healing and/or prevent further harm. A dressing can have a number of purposes, depending on the type, severity and position of the wound, although all purposes are focused towards promoting recovery and preventing further harm from the wound. Key purposes of dressing are: (1) be capable of maintaining high humidity at the wound-dressing interface whilst removing through adsorption excess wound exudates and associated toxic compounds; (2) permit the exchange of gases whilst maintaining an impermeable layer to microorganisms so preventing secondary infections; (3) provide thermal insulation; (4) all components of the dressing, including the adhesives, must be biocompatible and not provoke any allergic reaction through their prolonged contact with tissue; (5) there must be minimal adhesion to the surface of the wound so that the dressing can, when required, be removed without trauma; (6) the dressing must be physically strong even when wet; (7) be produced in a sterile form; and (8) easy to dispose of when removed at the end of use. If these criteria are met then the optimum healing environment for the wound would be maintained and the healing process enhanced (Lloyd, *et al.*, 1998).

Alginate is a natural biopolymer obtained from the cell wall of brown algae. Alginate have been extensively used in wound dressing applications due to their excellent biocompatibility, non-toxicity, and potential bioactivity, which can offer many advantages over traditional cotton and viscose gauzes. Alginate fibers, typically as a calcium salt, interact with the wound exudates to form a moist gel, as a result of the ion exchange between the calcium ions in the fiber and the sodium ions in exudates (Qin, *et al.*, 1996). This eliminates fiber entrapment in the wound, which is a major cause of patient trauma at dressing change. Such gelation provides the wound with a moist environment, which promotes healing and leads to a better cosmetic repair of the wound (Winter, 1962). This in situ generation of a moist healing environment and the consequent high absorbency of the alginate dressings are two of the outstanding properties which make the alginate dressing one of the most versatile wound dressings available today. In addition, alginate containing

dressings have been demonstrated to activate macrophages within the chronic wound bed and generate a pro-inflammatory signal which may initiate a resolving inflammation characteristic of healing wounds (Thomas, *et al.*, 2000). Therefore, commercially available alginate wound dressings are now commonplace (e.g. AlgiSite®, Kaltostat®, and Tegagel®) (Paul and Sharma, 2004) and alginate in a fiber form has been used widely (e.g. Algosteril®, Kaltostat®, and Sorbsan®) (Agren, 1996) because of their unique properties, such as high surface area, softness, and absorbency (Kennedy, *et al.*, 1996; Knill *et al.*, 2004).

Although alginate has many desirable properties for using as wound dressings, alginate itself does not well enough for the healing of wound. The mechanical properties of alginate should also be improved. Moreover, alginate does not have antimicrobial activity against the secondary infection. Therefore, in this study the concept of composite materials was used to achieve the most desirable properties for wound dressings. In this way, the scope of this research work is: 1) to develop alginate-based wound dressings by incorporation of the other natural polymeric as well as the synthetic substances in the alginate wet spun fiber in order to complement the properties of the final products and 2) to investigate the potential for use of the prepared alginate-based wet spun fibers as wound dressings. Various properties (e.g., chemical, morphological, mechanical, biodegradability, and antibacterial activity) of both the neat and the composite alginate-based wet spun fibers were investigated.