# CHAPTER I
# INTRODUCTION

Sericin — a silk glue — is a natural protein which holds silk fibroin filaments together in silk fiber. Sericin composes of various amino acids including essential amino acid. Importantly, the main amino acid is serine which is natural moisture factor (NMF) (Nagura, et al., 2001). Thus, sericin is widely used as an ingredient cosmetics industry, such as Blossom©, Dr.Temt©, Revital©, and Kristida©. It also has outstanding biomedical properties including antioxidant, antibacterial, and can improve cell viability as well as cell attachment.

Antioxidant ability plays important role of wound healing process to inhibit reactive oxygen species (ROS) radicals therefore can prevent further injury of wounds. For sericin exhibited antioxidant efficiency by interacting wirg hydroxyl radicals (Sarovart, et al., 2003). In cell culture test, 0.5 mM sericin-treated skin fibroblast cell line (AH927) was reported to inhibit hydrogen peroxide-induced radicals and improve cell viability, compared to hydrogen peroxide-treated fibroblasts (Dash, *et al.,* 2007). After human skin fibroblasts were cultured on sericin for 72 h, the living cell number was increased to 250% compared to no-sericin control (Tsubouchi, *et al.,* 2004) and also accelerated cell proliferation of hybridoma cells (Terada, et al., 2005). *In vivo* study revealed that, sericin-treated wound in rats took 90% healing time less than control-treated wound (Aramwit and Sangcakul, 2007). However, sericin has been neglected in tissue engineering and wound dressing applications because of its weak structural properties and high water solubility. Thus, it is difficult to be fabricated. Previously, these limitations of sericin were solved by blending, cross-linking, or copolymerizing sericin with other materials. In this study, fabrication problem of sericin was solved by imitating the nature of sericin itself. Briefly, nanofiber derived from nature (i.e. cellulose whisker) was used as a support material for sericin instead of silk fibroin.

Cellulose, the most abundant polysaccharide on earth, has multi-level structural organization. A cellulose fiber consists of cellulose nanofibrils. According to their high aspect ratio, cellulose nanofibers had been used in the field of reinforcement for decades, such as cellulose whisker derived from cotton linter reinforced poly(vinyl alcohol-*co*-vinyl acetate) (Roohani, *et al.*, 2008), Kraft wood cellulose microfiber reinforced gelatin composite (Xing, *et al.*, 2010), and flax nanofiber reinforced poly(lactic acid) (Liu, *et al.*, 2010). While, in the fields of cell culture and tissue engineering, 75% cellulose microfiber reinforced gelatin composite sponge not only improved mechanical strength, but also enhanced alignment of cell growth which cell orientation is important property especially neural tissue engineering application (Xing, et al., 2010).

Cellulose is found primarily in plant which embedded in lignin and hemicelluloses matrix and one of the abundant plants in Thailand is banana. Thailand can produce banana fruits several tons per year but, after fruiting, banana tree dies and becomes waste. As a result, banana trunk was used as a cellulose source in this study. In addition, chitin whisker was chosen as another component in order to improve an ability of the material to promote tissue repair of wound (Morganti, *et al.*, 2006).

Since bionanocomposite sponges composing of cellulose whisker, chitin whisker, and sericin were fabricated. They were characterized for their chemical structure and morphology. The potential properties for wound care applications were evaluated in terms of sericin releasing and cytotoxicity.