

**PREPARATION OF BACTERIAL CELLULOSE CONTAINING  
SILK SERICIN FOR WOUND DRESSING APPLICATION**



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**Program:** Polymer Science  
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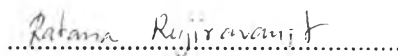
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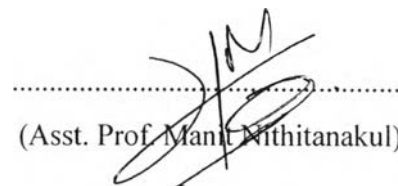


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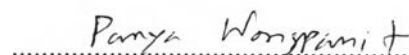
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## บทคัดย่อ

พื้ลัลักษณะ พิทยอภิพล : การเตรียมแผ่นปิดแผลจากเส้นใยแบคทีเรียเซลลูโลส และ เซริซิน (Preparation of Bacterial Cellulose Containing Silk Sericin for Wound Dressing Applicaton) อ. ที่ปริศึกษา : รศ.ดร. รัตนา รุจิรวนิช 85 หน้า

งานวิจัยนี้ได้ทำการพัฒนาแผ่นปิดแผลที่มีสมบัติเหมาะสมในการรักษาแผล โดยการเตรียมแผ่นปิดแผลจากแบคทีเรียเซลลูโลสที่เคลือบด้วยสารสกัดเซริซิน หรือ โปรตีนกาวไหม ที่มีบทบาทในการเพิ่มประสิทธิภาพในกระบวนการรักษาแผลได้ดี เนื่องจากเซริซินมีสมบัติต้านทานการเกิดปฏิกิริยาออกซิเดชัน คงสภาพความชุ่มชื้นให้กับแผล รวมถึงเอื้อต่อการเจริญเติบโตของเซลล์และไม่เป็นพิษต่อเซลล์ แต่อย่างไรก็ตามเมื่อนำเซริซินมาขึ้นรูปจะมีลักษณะเปราะและไม่สามารถใช้งานได้ ดังนั้นจึงทำการเตรียมเซริซินร่วมกับแผ่นแบคทีเรียเซลลูโลส ที่ผลิตขึ้นจากแบคทีเรียชนิด *Acetobacter Xylinum* มีโครงสร้างเป็นแบบตาข่ายร่างแหสามมิติ ลักษณะคล้ายไฮโดรเจล ซึ่งช่วยคงสภาพความชุ่มชื้น พร้อมทั้งดูดซับน้ำเหลืองออกจากแผลได้มาก ตลอดจนถ่ายเทอากาศได้ดี และลอกออกจากแผลได้ง่ายโดยที่ไม่เกิดความเจ็บปวดและไม่ทำลายเนื้อเยื่อที่สร้างขึ้นใหม่ จากการศึกษา ลักษณะโครงสร้างทางเคมี ลักษณะสัณฐานวิทยา และปริมาณของเซริซินในแผ่นเส้นใยแบคทีเรียเซลลูโลส นั้นยืนยันว่าเซริซินสามารถเคลือบลงบนแผ่นเส้นใยแบคทีเรียเซลลูโลสได้ ผลจากการเคลือบเซริซินลงบนแผ่นเส้นใยแบคทีเรียเซลลูโลสพบว่าเมื่อปริมาณเซริซินที่เพิ่มขึ้น สามารถเพิ่มคุณสมบัติในการดูดซับน้ำ และลดอัตราการซึมผ่านของไอน้ำ ซึ่งแสดงให้เห็นว่า เซริซินมีความสามารถในการคงความชุ่มชื้นให้แก่แผลได้ดี สมบัติด้านการต้านทานปฏิกิริยาออกซิเดชัน อัตราการปลดปล่อยของเซริซิน เพิ่มขึ้นเมื่อปริมาณของเซริซินที่ใช้เคลือบลงบนแผ่นเส้นใยเซลลูโลสสูงขึ้น จากการทดสอบความเป็นพิษต่อเซลล์ผิวหนังพบว่าวัสดุปิดแผลที่เตรียมได้นี้ไม่เป็นพิษต่อเซลล์ผิวหนัง โดยสมบัติเด่นของเซริซินและเส้นใยแบคทีเรียเซลลูโลสดังกล่าวที่ทำหน้าที่ส่งเสริมกันนั้นสามารถประยุกต์ใช้เป็นวัสดุแผ่นปิดแผลที่มีประสิทธิภาพในการช่วยรักษาแผลได้ดี

## ABSTRACT

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Bacterial cellulose (BC) containing silk sericin, a novel wound dressing, was successfully developed. It is known that silk sericin, a glue-like protein in raw silk fibers, is useful for skin care applications due to its biocompatibility as well as antioxidant, moisturizing capabilities and promoting in wound healing process. However, pure sericin is quite fragile and difficult to fabricate. In this study, sericin, extracted from silk cocoons, was incorporated into BC pellicles. The BC pellicles, produced by *Acetobacter xylinum*, have an ultrafine nano-fibril network structure, making it function like a hydrogel. Accordingly, BC is a good candidate for possible use as a wound dressing because of its capability to absorb wound exudate and provide a moist environment. Fourier transform infrared spectroscopy (FTIR), Kjeldahl analysis, and scanning electron microscope (SEM) observation indicated the presence of sericin in BC. The incorporation of sericin into BC resulted in the increase of water absorption capacity. The release rate of sericin and antioxidant activity increased with increasing sericin content in BC. The BC sample with higher sericin content exhibited a lower water vapor transmission rate, indicating that sericin could provide and maintain a moist environment. Moreover, BC containing sericin was non-cytotoxic to human dermal fibroblast cell lines.

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