

**CHITIN-CHITOSAN BIOMATERIAL: AN EXPECTATION FOR
CONTROLLED RELEASE SYSTEM MODIFIED FROM
MOLECULAR LEVEL**

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ABSTRACT

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γ -Ray irradiation was used to reduce molecular weight of chitin-chitosan dispersed in water. The irradiated chitosan changed from flake to powder with the decrease in molecular weight for 70%. XRD patterns clarified the increase of amorphous related to the dose of γ -ray. The γ -ray irradiated chitosan was conjugated with stearylamine and glutaraldehyde by reductive amination. The present reaction was unique in terms of carrying out in dilute acetic acid solution under ambient temperature within few hours. The hydrophobic chain was successfully introduced onto chitosan chain to give γ -ray irradiated chitosan-stearylamine-glutaraldehyde (ICGS) with the methylene peak at 2922 cm^{-1} increasing for 20%, analyzed by quantitative FT-IR technique, as compared to that for unirradiated chitosan. The ICGS showed the hypochromic effect with the model drug, Chloramphenicol, implying the interaction between ICGS and Chloramphenicol. The present work demonstrates that when chitosan is modified with hydrophobic chain, the hydrophobic and/or hydrophilic interactions with drug molecules could be induced which will be the practical approach for controlled release system.

บทคัดย่อ

นางสาวปาริชาติ โลหมาศ: โคลติน-ไคโตซานวัสดุชีวภาพ: การไปสู่เป้าประสงค์สำหรับระบบควบคุมการออกฤทธิ์ซึ่งได้จากการปรับโครงสร้างในระดับโมเลกุล (Chitin-Chitosan Biomaterial: An Expectation for Controlled Release System modified from Molecular Level) อ. ที่ปรึกษา: ผศ. ดร. สุวบุญ จิระกาญจน์ และ ศ. ดร. มิตสึรุ อากาชิ (Prof. Mitsuru Akashi), 48 หน้า ISBN 974-13-0723-3

การฉายรังสีด้วยรังสีแกมมาถูกนำมาใช้เพื่อลดน้ำหนักโมเลกุลของไคติน-ไคโตซานซึ่งแขวนลอยอยู่ในน้ำ ไคโตซานที่ผ่านการฉายรังสีจะเปลี่ยนสภาพจากแผ่นเล็กๆ เป็นผงที่ละเอียดขึ้นและน้ำหนักโมเลกุลลดลงถึง 70 เปอร์เซ็นต์ รูปแบบกราฟ XRD ชี้ชัดว่าการเพิ่มขึ้นของส่วนอสัณฐานนั้นสัมพันธ์กับปริมาณรังสีแกมมาที่ฉาย ไคโตซานที่ผ่านการฉายรังสีแกมมาได้ถูกเชื่อมต่อกับสเตียริลเอมีน (Sterylamine) และกลูตาโรลดีไฮด์ (Glutaraldehyde) โดยผ่านปฏิกิริยารีดักทีฟเอมีเนชัน (Reductive Amination) ปฏิกิริยานี้โดดเด่นในแง่ที่ปฏิกิริยาดำเนินไปในสารละลายกรดอะซิติกเจือจางภายใต้อุณหภูมิห้องภายในเวลาสั้น สายโซ่โมเลกุลที่ไม่ชอบน้ำถูกต่อลงบนสายโซ่ไคโตซานได้สำเร็จและได้ผลิตภัณฑ์ที่เรียกว่า γ -ray irradiated chitosan-sterylamine-glutaraldehyde (ICGS) ดังปรากฏจากผลวิเคราะห์เชิงปริมาณด้วย FT-IR ซึ่งพบว่า จุดสูงสุดของกราฟของหมู่เมทิลีนที่ตำแหน่ง 2922 เลขคลื่นเพิ่มขึ้นถึง 20 เปอร์เซ็นต์เมื่อเปรียบเทียบกับไคโตซานที่ไม่ได้ผ่านการฉายรังสี การศึกษาพบว่า ICGS ที่ได้นี้แสดงผลไฮโปโครมิก (Hypochromic Effect) กับยาตัวแบบซึ่งคือ คลอแรมเฟนิคอล (Chloramphenicol) ผลการทดลองเป็นนัยถึงพันธะระหว่าง ICGS กับคลอแรมเฟนิคอล งานวิจัยนี้แสดงให้เห็นว่า เมื่อไคโตซานถูกปรับโครงสร้างด้วยสายโซ่โมเลกุลที่ไม่ชอบน้ำ พันธะที่เกิดจากปฏิกิริยาไม่ชอบน้ำและ/หรือปฏิกิริยาชอบน้ำต่อโมเลกุลของยาจะถูกกระตุ้นให้เกิดขึ้นได้ซึ่งจะเป็นแนวทางหนึ่งที่จะประยุกต์ให้เกิดการใช้งานได้จริงสำหรับระบบควบคุมการออกฤทธิ์

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