

การปลดปล่อยแบบควบคุมของไซเตียมไดโคลฟีแนคจากบีตโคโตซานและคาร์แรจีแนน

นางสาวพิมพ์วิภา ปิยกุละวัฒน์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต

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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย

CONTROLLED RELEASE OF SODIUM DICLOFENAC FROM
CHITOSAN/CARRAGEENAN BEADS

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พิมพ์วิภา ปิยกุลละวัฒน์ : การปลดปล่อยแบบควบคุมของโซเดียมไคลโคโลฟีแนคจากบีดไคโตซานและคาร์เรจีแนน. (CONTROLLED RELEASE OF SODIUM DICLOFENAC FROM CHITOSAN/CARRAGEENAN BEADS) อ. ที่ปรึกษา: ศศ.ดร. นงนุช เหมือนสิน, อ. ที่ปรึกษาร่วม: สพ.ญ.ดร. นลินา ประไพรักษ์สิทธิ์ 133 หน้า. ISBN 974-14 -2957-6.

งานวิจัยนี้มุ่งเน้นศึกษาการควบคุมการปลดปล่อยยาโซเดียมไคลโคโลฟีแนคจากพอลิอิเล็กโตรไลต์คอมเพลกซ์ในรูปแบบของบีดที่เตรียมขึ้นจากไคโตซานและคาร์เรจีแนนในระบบทางเดินอาหาร รวมทั้งศึกษาปัจจัยที่มีอิทธิพลต่อการปลดปล่อยยา ได้แก่ อัตราส่วนระหว่างไคโตซาน/คาร์เรจีแนน ปริมาณของไคลโคโลฟีแนค รวมถึงชนิดและปริมาณของสารเชื่อมขวาง โดยสูตรผสมที่ประกอบด้วยไคโตซาน/คาร์เรจีแนนในอัตราส่วน 2/1 และ ไคลโคโลฟีแนค 5% (w/v) ให้ผลในการในการควบคุมการปลดปล่อยยาได้ดีกว่าสูตรผสมอื่นๆ โดยสามารถควบคุมการปลดปล่อยยาด้านานกว่า 8 ชั่วโมง เมื่อนำบีดที่ได้ไปเชื่อมขวางด้วยกรดกลูตาริก และ กลูตารัลดีไฮด์ พบว่าบีดให้ประสิทธิภาพในการปลดปล่อยยาด้านานยิ่งขึ้น โดยบีดที่มีการเชื่อมขวางด้วยกลูตารัลดีไฮด์สามารถควบคุมการปลดปล่อยยาด้านานกว่า 24 ชั่วโมง การปลดปล่อยยาที่แตกต่างกันของบีดสามารถอธิบายได้ว่าเป็นผลจากแรงกระทำระหว่างอออนของประจุตรงกันข้าม และความเข้มข้นของยาภายในบีดที่แตกต่างกันซึ่งขึ้นอยู่กับส่วนประกอบที่ใช้ในการเตรียมสูตรผสม และ pH ของสารละลายตัวกลาง โดยการปลดปล่อยยาถูกควบคุมด้วยกลไกการละลายของยาในสารละลายตัวกลางร่วมกับกลไกการแพร่ของยาจากภายในบีด

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ลายมือชื่อนิสิต.....พิมพ์วิภา ปิยกุลละวัฒน์.....

ลายมือชื่ออาจารย์ที่ปรึกษา.....นงนุช เหมือนสิน.....

ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....นลินา ประไพรักษ์สิทธิ์.....

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PHIMWIPHA PIYAKULAWAT: CONTROLLED RELEASE OF SODIUM
 DICLOFENAC FROM CHITOSAN/CARRAGEENAN BEADS. THESIS
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This work aims to study polyelectrolyte complex (PEC) hydrogel beads based on chitosan (CS) and carrageenan (CR) as a sodium diclofenac (DFNa) controlled release device in the simulated gastrointestinal condition. Various factors potentially influencing the drug release, i.e. CS/CR proportion, DFNa content, and types and amount of crosslinking agent, were also investigated. The optimal formulation was obtained with CS/CR proportion of 2/1 and 5% (w/v) DFNa. The controlled release of the drug from this formulation was superior to the other formulations and was able to maintain the release for approximately 8 hours. Upon crosslinking with glutaric acid and glutaraldehyde, the resulting beads were found to be more efficient in the drug prolonged release than their non-crosslinking counterparts. The bead crosslinked with glutaraldehyde was able to control the release of the drug over 24 hours. The difference in the drug release behavior can be contributed to the differences of ionic interaction between the oppositely charged and concentrations of the drug within the beads which depended on the compositions of formulation and pH of dissolution medium. The release of drug was controlled by the mechanism of the dissolution of DFNa in the dissolution medium and the diffusion of DFNa through the hydrogel bead.

Field of Study Petrochemistry and Polymer Science. Student's Signature... *Phimwipha Piyakulawat*
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LIST OF ABBREVIATIONS

CS	Chitosan
CR	Carrageenan
°C	degree Celsius (centigrade)
cm ⁻¹	Unit of wave number
DFNa	Sodium diclofenac
DSC	Differential scanning calorimeter
DTG	The derivative thermogravimetric
EE	The encapsulation efficiency
FT-IR	Fourier transform infrared spectrometer
GA	Glutaric acid
GD	Glutaraldehyde
LE	The loading efficiency
PEC	Polyelectrolyte complex
pH	The negative logarithm of the hydrogen ion concentration
pKa	The negative logarithm of the acid dissociation constant
ppm	Part per million
r ²	The correlation coefficient
S.D.	Standard deviation
SEM	Scanning electron microscope
S _w	The swelling ratio
TGA	Thermogravimetric analyzer
UV	Ultraviolet
(w/v)	Weight by volume
(w/w)	Weight by weight