

ไมโครเอ็นแคปซูลเส้นของดี-แพนทีนอลในโปรตีนคอสลิงค์กับเทรพทโลอิลคลอไรด์



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**MICROENCAPSULATION OF D-PANTHENOL RETAINING PROTEIN  
CROSS-LINKED WITH TEREPHTHALOYL CHLORIDE**

**Miss Naowarat Sananpanitchkul**

**A Thesis Submitted in Partial Fulfillment of the Requirements  
for the Degree of Master of Science in Pharmaceutical Technology**

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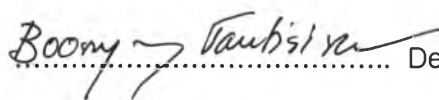
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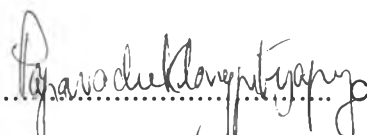
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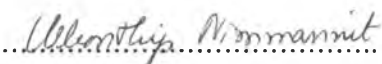
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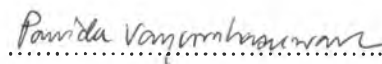
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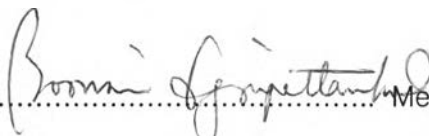
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ดี-แพนทีนอลไมโครแคปซูลเป็นที่นิยมใช้ในผลิตภัณฑ์เครื่องสำอาง สามารถเตรียมโดยวิธี  
อินเตอร์เฟซียล-ครอสลิงค์โปรตีนกับเทเรพทโลอิลคลอไรด์ การวิจัยนี้ได้มีการศึกษาตัวแปรต่างๆ ที่  
มีผลต่อการเกิดไมโครแคปซูล เช่น ชนิดของโปรตีนที่ใช้ ความเข้มข้นของสารโปรตีน ความเข้มข้น  
ของสารครอสลิงค์และความเร็วรอบในการเตรียม ชนิดของโปรตีนที่ใช้ในการศึกษาคือ โบวีนเซรัม  
อัลบูมิน โอวัลบูมินและเจลาติน พบว่า โบวีนเซรัมอัลบูมินและโอวัลบูมินสามารถเตรียมไมโคร  
แคปซูลที่มีรูปร่างกลมและผิวเรียบ ในขณะที่เจลาตินไม่สามารถเตรียมไมโครแคปซูลได้ ดังนั้น  
โบวีนเซรัมอัลบูมินได้ถูกเลือกเพื่อใช้ในการเตรียมโบวีนเซรัมอัลบูมิน-เทเรพทโลอิลคลอไรด์ไมโคร  
แคปซูลซึ่งพบว่าเมื่อเพิ่มความเข้มข้นของโบวีนเซรัมอัลบูมินจะทำให้ได้ปริมาณไมโครแคปซูลที่  
มากขึ้นและสูงสุดที่ 70 เปอร์เซ็นต์ เมื่อใช้ 20 เปอร์เซ็นต์ ของโบวีนเซรัมอัลบูมินกับ 5 เปอร์เซ็นต์  
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ไมครอน การเพิ่มความเร็วนรอบที่ 11,000 รอบต่อนาทีจะทำให้ขนาดของไมโครแคปซูลเล็กลงถึง  
30 ไมครอน ในการเตรียมดี-แพนทีนอลไมโครแคปซูลนั้น การปรับเปลี่ยนความเข้มข้นของ  
ดี-แพนทีนอลและโบวีนเซรัมอัลบูมินมีผลต่อคุณสมบัติทางกายภาพของไมโครแคปซูล พบว่าไมโคร  
แคปซูลที่เตรียมได้ จะมีรูปร่างไม่กลม มีผนังหยาบแต่มีความคงตัวและมีการไหลอิสระที่ดี ขนาด  
เส้นผ่าศูนย์กลางที่ได้อยู่ระหว่าง 349-660 ไมครอน ปริมาณไมโครแคปซูลที่เตรียมได้อยู่ระหว่าง  
80-90 เปอร์เซ็นต์ และปริมาณของดี-แพนทีนอลในไมโครแคปซูลสูงถึง 68.2 เปอร์เซ็นต์เมื่อเตรียม  
โดยใช้ 13.3 เปอร์เซ็นต์ น้ำหนักโดยปริมาตรดี-แพนทีนอล กับ 20 เปอร์เซ็นต์ น้ำหนักโดยปริมาตร  
ของโบวีนเซรัมอัลบูมิน

ลายมือชื่อนิสิต..... 

สาขาวิชาเทคโนโลยีเภสัชกรรม..... ลายมือชื่ออาจารย์ที่ปรึกษา..... 

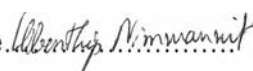
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TEREPHTHALOYL CHLORIDE/ BOVINE SERUM ALBUMIN.

NAOWARAT SANANPANITCHKUL: MICROENCAPSULATION OF D-PANTHENOL  
RETAINING PROTEIN CROSS-LINKED WITH TEREPHTHALOYL CHLORIDE. THESIS  
ADVISOR: ASSOC. PROF.UBONTHIP NIMMANNIT, Ph. D., 113 pp. ISBN 974-17-1356-8

D-panthenol microcapsules, widely used for topical cosmetic applications, were prepared by interfacial cross-linking protein with terephthaloyl chloride (TC). Factors affecting microcapsule formation such as types of proteins, concentrations of proteins, concentrations of cross-linking agent and stirring rate were investigated. Bovine serum albumin, ovalbumin and gelatin were studied. Microcapsules obtained from bovine serum albumin and ovalbumin were spherical with smooth surface while gelatin could not be retained as microcapsules. Bovine serum albumin (BSA) was selected for preparation of BSA-TC microcapsules. An increase in concentration of BSA increased the yield of microcapsules with a maximum at 70% when 20% w/v BSA and 5%w/v TC were used. The mean range of microcapsules diameter was between 91-377 $\mu$ m. When the stirring rate was increased to 11000 rpm, microcapsules became smaller with an average of 30  $\mu$ m decrease in sizes. The condition for preparation of BSA-TC walled D-panthenol microcapsules was studied by varying concentrations of D-panthenol and BSA. It was found that D-panthenol loading affected the physical appearances of microcapsules. The shape of BSA-TC walled D-panthenol microcapsules obtained was irregular with rough surface. However, they were stable and free flowing upon drying. The diameter was between 349-660  $\mu$ m. The microcapsules yield was 80-90% and the highest entrapment of D-panthenol was 68.2% when D-panthenol was added at 13.3%w/v in 20%w/v bovine serum albumin solution.

Student's signature.....

Field of study Pharmaceutical Technology..... Advisor's signature.....

Academic year 2002..... Co-advisor's signature.....

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## LIST OF ABBREVIATIONS

%w/v	=	percent weight by volume
%w/w	=	percent weight by weight
μl	=	microlitre
μm	=	micrometer
ANOVA	=	analysis of variance
BSA	=	bovine serum albumin
Conc.	=	concentration
CV	=	coefficient of variation
et al.	=	and others
GEL	=	gelatin
HPLC	=	high performance liquid chromatography
IFP	=	Interfacial polymerization
mg	=	milligram
min	=	minutes
ml	=	milliliter
nm	=	nanometre
°C	=	degree Celcius
OVAL	=	ovalbumin
PEE	=	pantothenyl ethyl ether
pp	=	page
R <sup>2</sup>	=	coefficient of determination
rpm	=	revolutions per minute
SD	=	standard deviation
TC	=	terephthaloyl chloride
UV	=	ultraviolet