

**Developing a new microemulsion using nonionic surfactants for transdermal
and oral application of gentamicin in rats as animal model**

By



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**This thesis was submitted in partial fulfillment of the requirements for the
Master's degree in pharmaceutical sciences**

Faculty of pharmacy

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تطوير مستحلب دقيق باستخدام تقنية العوامل الفعالة على السطح الغير متأينة من أجل التطبيق الجلدي و الفموي للجنتاميسين على الفئران كنموذج حيواني.



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الطالبة : آلاء صالح مهدي الربيعي

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تم إعداد هذه الأطروحة لنيل درجة الماجستير في العلوم الصيدلانية

كلية الصيدلة

جامعة الإبراهيم

تطوير مستحلب دقيق باستخدام تقنية العوامل الفعالة على السطح الغير متأينة من أجل التطبيق الجلدي و الفموي للجنتاميسين على الفئران كنموذج حيواني.

الملخص:

يستخدم جنتاميسين عادة عن طريق الوريد أو الحقن العضلي بسبب ضعف التوافر الحيوي عن طريق الفم. و بما أن التطبيق الوريدي والعضلي يحتاجان إلى مهارة و يرتبطان بالألم فإن هذه الدراسة تهدف إلى تطوير مستحلبات بأبعاد النانو عن طريق العوامل الفعالة على السطح الغير متأينة للتطبيق عن طريق الفم و عبر الجلد. وقد تم في هذه الدراسة تقييم حجم قطيراتها، وخصائص اللزوجة. وعلاوة على ذلك تم تقييم النفاذية عبر الجلد من خلال تقدير معامل التدفق من خلال جلد الجرذان باستخدام خلية فرانز. وأظهرت النتائج أن مواصفات هذه المستحلبات تتطابق مع الخصائص الغروية. تم اختيار المستحلب ذي أعلى تدفق 1.892 ملغم / سم² * ساعة من هذه المستحضرات لقياس التوافر الحيوي عن طريق الفم في الفئران بالمقارنة مع محلول مائي من الجنتاميسين. وأظهرت هذا المستحلب توافر حيوي نسبي مؤوي 239.7% بالمقارنة مع المحلول المائي عن طريق الفم.

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LIST OF ABBREVIATION AND SYMBOLS

SYMBOL ABBREVIATION	DEFINITION
AUC	Area under the curve
BA	Bioavailability
C_{max}	maximum concentration
CS	Chitosan
DMSO	Dimethylsulfoxide
GI	Gastrointestinal
GS	Gentamicin sulfate
HPLC	High-pressure liquid chromatography
Hr	hour(s)
Jss	Steady State Flux
K10	Elimination rate constant
T_{lag}	Lag time
ME	Microemulsion
O/W	Oil in Water
P	Permeability constant
PDI	Polydispersity Index
SC	stratum corneum
Span 20	Sorbitanmonolaurate
T_{max}	Time of maximum concentration
TDDS	Transdermal drug delivery system
Tween 80	Poloxyethlenesorbitan mono-oleate
Vol	Volume
IPM	Isopropyl Myristate
W/O	Water in Oil
W	Water

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Abstract

Gentamycin (GS) is administered as intravenous or intramuscular solution because of its poor oral bioavailability. However, the intravenous administration associated with pain and needs some skills. In this study, five nonionic microemulsions (MEs) for oral and transdermal application were developed using nonionic surfactants. The MEs were characterized for their droplets sizes, rheological properties. Furthermore, the transdermal was evaluated by estimation the flux and permeability coefficient through rat's skin using Franz diffusion cell. The results show that the MEs complied with the colloidal properties. The ME with highest flux of $1.892 \text{ mg/cm}^2 \cdot \text{h}$ of these formulations was chosen for further oral bioavailability in rats in comparison to an aqueous solution of GS. The ME showed a percentage relative bioavailability of 239.7 % in comparison to an oral solution.