



**Developing a New Microemulsion Using Nonionic Surfactants for
Transdermal Delivery of Atenolol through Rat Skin**

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LIST OF ABBREVIATION

| ABBREVIATION | DEFINITION |
|--------------|---|
| AT | Atenolol |
| B | Beta |
| C | Citric acid |
| DMSO | Dimethyl Sulfoxide |
| E | Ethanol |
| FTIR | fourier transform infrared spectroscopy |
| HPLC | High performance liquid chromatography |
| Hr | Hour(s) |
| IPM | Isopropyl Myristate |
| Jss | Steady State Flux |
| K10 | Elimination rate constant |
| MEs | Microemulsion |
| O/W | Oil in Water |
| PDI | Poly dispersity Index |
| SC | stratum corneum |
| Span 20 | Sorbitan mono-laurate |
| TDDS | Transdermal drug delivery system |
| Tween 80 | Poly oxy ethylene sorbitan mono-laurate |
| Vol | Volume |
| W | Water |
| W/O | Water in Oil |

Developing a new microemulsion using nonionic surfactants for transdermal delivery of Atenolol through rat skin

Abstract

In this study, seven loaded atenolol (AT) nonionic microemulsions (MEs) were developed and evaluated *in vivo* and *in vitro* for transdermal application of atenolol with aid of nonionic surfactants. The MEs were characterized for their droplet sizes, rheological properties. Also, the FTIR was used for evaluation of encapsulation of AT in MEs. Furthermore, the permeation of AT loaded MEs was studied through rat's skin *in vitro* using Franz diffusion cell over 24 hrs as well as *in vivo* in rats. The results show that AT loaded MEs have colloidal characteristics regarding their droplet size, transparency and rheological characteristics. Moreover, the FTIR showed that AT was inside the dispersed phase. The highest flux value for AT loaded MEs through the skin using Franz diffusion cell was 263.53 $\mu\text{g}/\text{cm}^2\text{hr}$ and the maximum plasma level of AT 4.17mg/ml was monitored after 7 hrs.

تطوير مستحلبات دقيقة جديدة باستخدام العوامل الفعالة على السطح الغير الأيونية لتطبيق عبر الجلد للأتينولول من خلال الجلد الفئران

ملخص

في هذه الدراسة، تم تطوير سبعة مستحلبات دقيقة غير أيونية تحتوي على الأتينولول و تم تقييم إمتصاصها الجلدي في المختبر عبر جلد الجرذان. وقد تطابقت المستحضرات مع خصائص المستحضرات الغرويدية و ذلك لأحجام قطراتها، وخصائص اللزوجة و الشفافية. واستخدمت أيضا مطياف الأشعة تحت الحمراء لتقييم إندماج الأتينولول في المستحلبات الدقيقة. وعلاوة على ذلك، تم دراسة نفاذية الأتينولول من خلال الجلد الجرذان في المختبر باستخدام خلايا فرانس على مدى 24 ساعة، وكذلك في الجسم الحي في الفئران. وتظهر النتائج أن المستحلبات الدقيقة المحملة بالأتينولول لها خصائص غروية فيما يتعلق بحجم قطراتها وشفافيتها وخصائصها اللزوجية. وعلاوة على ذلك، أظهرت أطياف الأشعة تحت الحمراء أن الأتينولول كان داخل المرحلة الطور الداخلي المبعثر. كانت أعلى قيمة تدفق للأتينولول من خلال الجلد باستخدام خلية فرانس 263.53 $\mu\text{g}/\text{cm}^2\text{hr}$ وكما تم رصد الحد الأقصى للمستوى البلازم من الأتينولول 4.17 mg/ml بعد 7 ساعات.