

EFFECT OF IONTOPHORESIS AND PENETRATION ENHANCERS ON THE IN VITRO DIFFUSION OF PIROXICAM GEL

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Supervised by

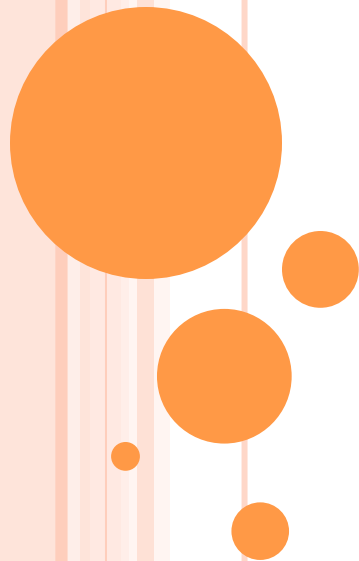
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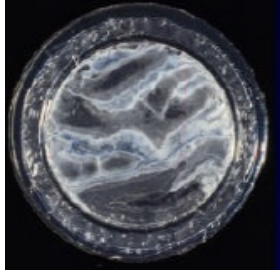
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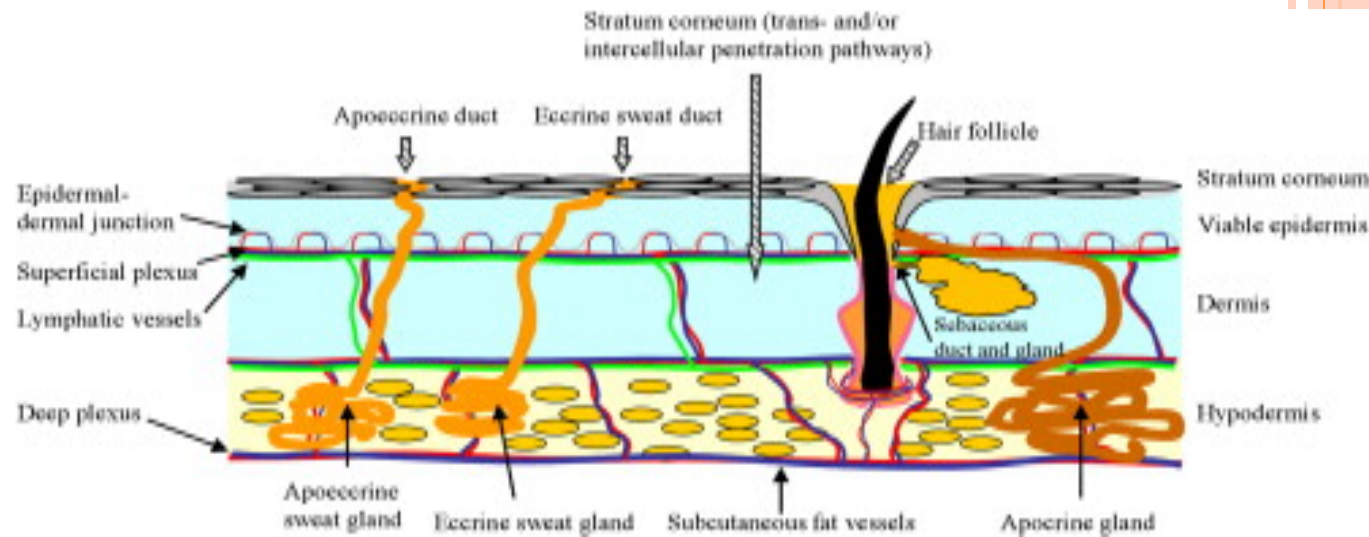
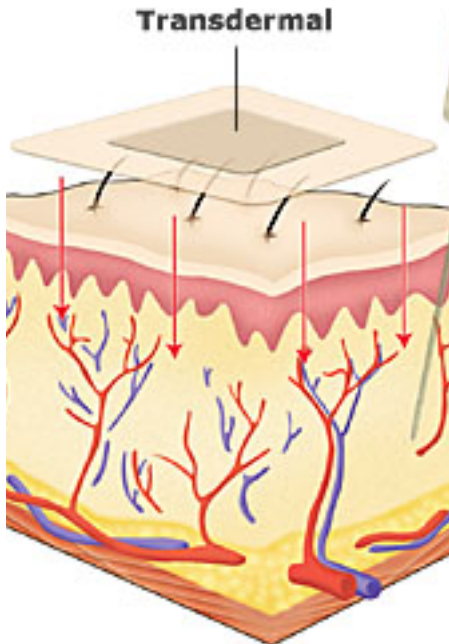
INTRODUCTION

Transdermal drug delivery

- Advantages
- Disadvantages

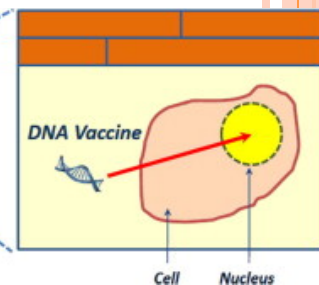
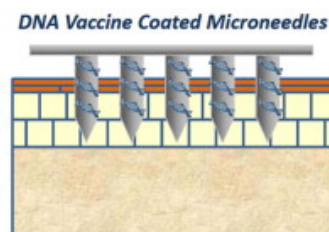
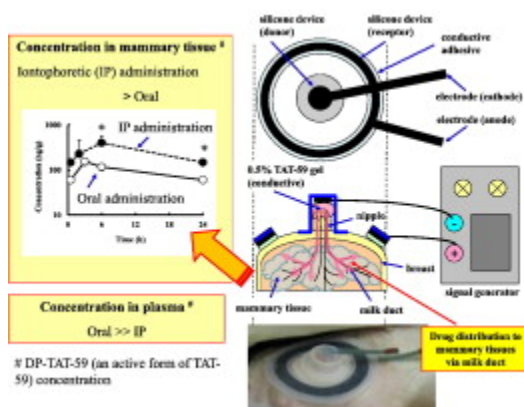
Strategies for overcoming the stratum corneum :

- Chemical approach (Penetrance enhancers)
- Physical approach (Iontophoresis)
- Synergistic approach (Combination)

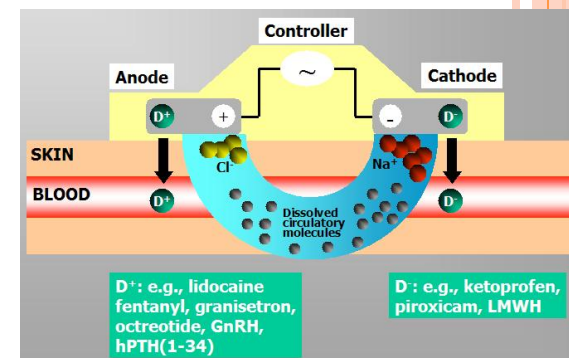


Iontophoresis nowadays

- Novel Iontophoresis application - Breast cancer therapy
- Drug monitoring – Reverse iontophoresis for measuring Uric acid level
- Other non invasive technique – Microneedle for delivering DNA vaccine



INTRODUCTION CONT'



Piroxicam

- Gastric irritation when oral application
- Low permeability through the skin,
- Two pKa, (1.8 and 5.2) corresponding to the pyridyl and enol structural groups. MW Average: 331.346
- Very little soluble in water and organic solvents but soluble in alkaline pH, It need Triethanolamin in formulation which has a pH value of 10.5 for increasing the solubility of piroxicam

Carbopol 940-based gel

- Easily dispersed in water due to hydrophilic group and in small concentrations (0.02-2%) and it is easy to use and wash with water
- Can be used as base gel with sufficient consistency

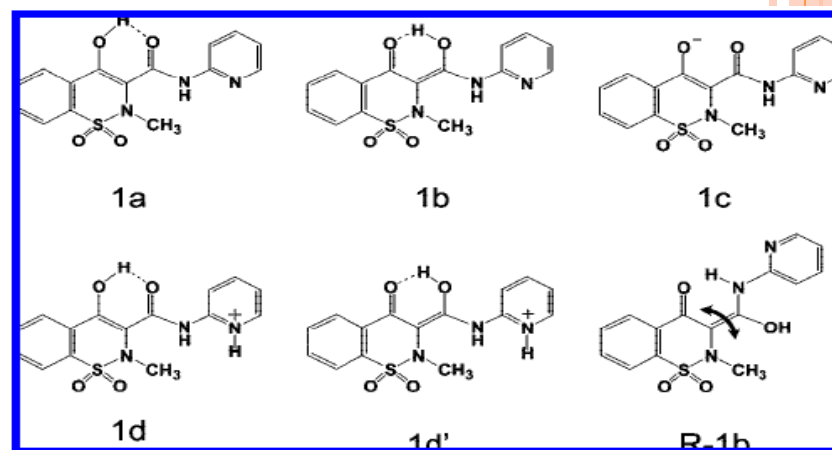


Figure 1. Structures of piroxicam (1): enol (1a), keto (1b), anionic (1c), cationic (1d), keto cationic (1d') forms, and one possible rotamer of keto structure (R-1b).

OBJECTIVE AND ADVANTAGE

- The purpose of this study was to determine the combination effect between addition of penetrance enhancers and application of iontophoresis method on diffusion of piroxicam gel
- This study is the starting point which can be used for finding other novel non-invasive techniques to enhance transdermal drug delivery



METHOD

Formulas of Piroxicam Gel

Material	F _s	F ₁	F ₂	F ₃	F ₄
Carbopol 940	1	1	1	1	1
Piroxicam	0,5	0,5	0,5	0,5	0,5
Trietanolamin	3	3	3	3	3
Etanol	-	5	-	-	-
Dimethyl sulfoxide	-	-	5	-	-
Ethyl acetate	-	-	-	5	-
Tween 80	-	-	-	-10	5
Distilled water ad	100	100	100	0	100

Evaluation of Piroxicam Gel

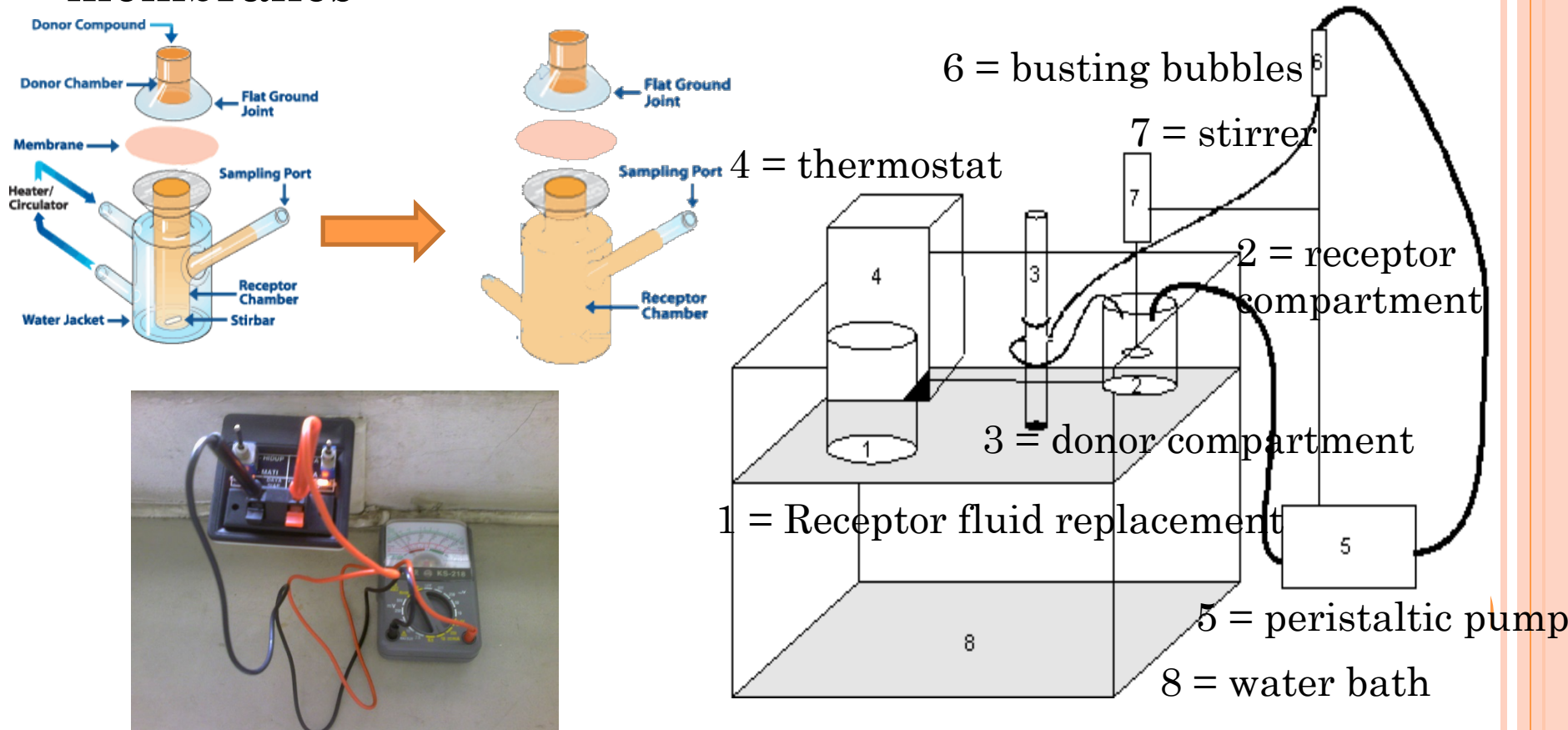
Organoleptic, Viscosity, pH, and homogeneity



METHOD – CONT'

In vitro diffusion test

In vitro diffusion test was performed using the flow through method with Modified-Franz diffusion cell and porcine ears were obtained from a slaughterhouse as membranes



RESULTS

Evaluation of Piroxicam Gel

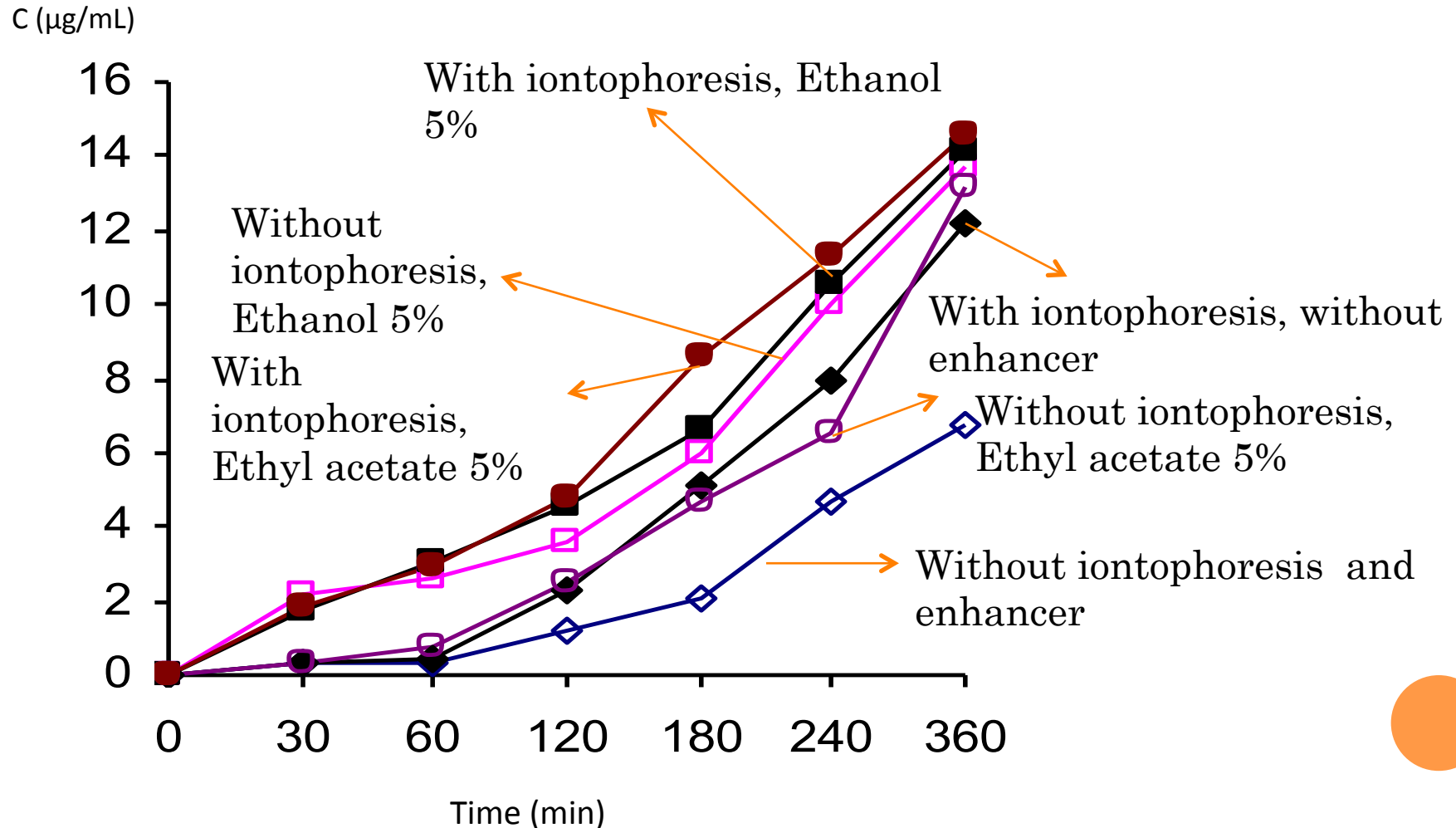
Test	Test Formula				
	FS (no enhancer)	F1 (5% Ethanol)	F2 (5% DMSO)	F3 (5% Ethyl Ac)	F4 (5% Tween 80)
Organoleptic					
- Color	- Y e l l o w transparent	- Y e l l o w transparent	- Y e l l o w transparen	- Y e l l o w transparent	- Y e l l o w transparent
- Smell	- No smell	- No smell	- No smell	- No smell	- No smell
pH	8,11±0,01	8,13±0,01	8.24±0,01	7.80±0,01	8.20±0,01
Viscosity (P)	1378,00±48,04	1260,00±34,64	1324,00±3,60	1247,33±45,34	1261,33±8,14
The content of piroxicam* (µg/mL)	50,66±2,10	49,62±0,40	49,99±1,56	49,48±0,50	50,18±1,22

*In every 0.1g of gel



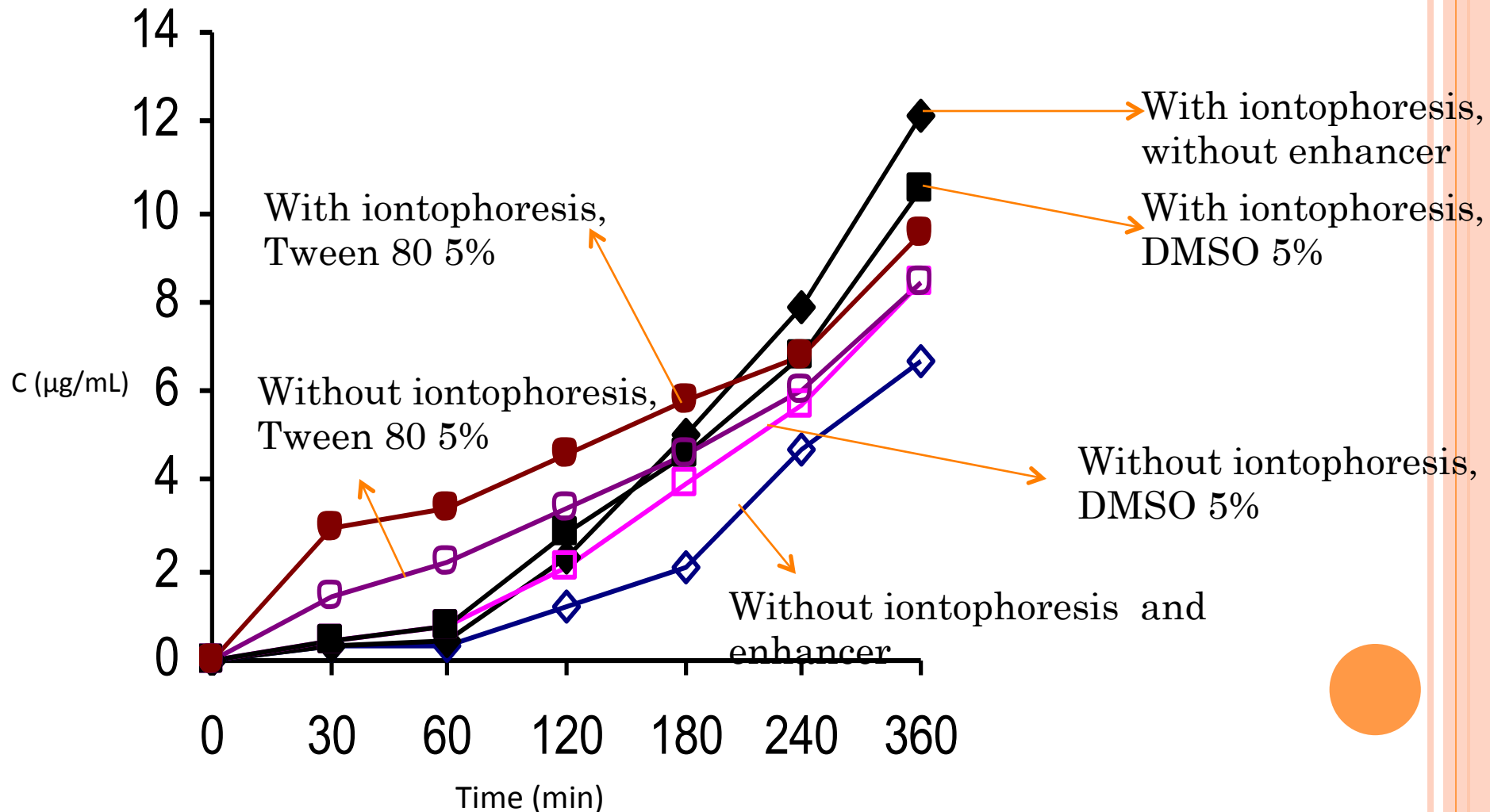
RESULTS – CONT'

The synergistic effect between chemical and physical method on the rate of piroxicam diffusion



RESULTS – CONT'

The non-synergistic effect between chemical and physical method on the rate of piroxicam diffusion



CONCLUSION

The combination effect of penetrance enhancer and iontophoresis showed a better synergic effect in the formula F1(ethanol) and F3(Ethyl acetate), while in F2(DMSO) and F4(Tween 80) was unclear.



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Thank you very much for your
attention

どうもありがとうございました

