

Permeation of ibuprofen across pig ear skin from bioadhesive film: effect of chemical enhancers and occlusion



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Introduction

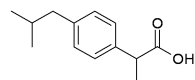
Transdermal drug administration represents nowadays a valid alternative to conventional administration routes. Transdermal administration is realized using specialized drug delivery systems, in the form of transdermal patches. We have recently described an innovative transdermal drug delivery system, a non occlusive film intended for dermal and/or transdermal delivery, denominated Patch-non-Patch® [1, 2].



Ibuprofen is a non steroidal anti-inflammatory drug (NSAID) used topically to treat local inflammation. Over the counter products available for topical administration of ibuprofen are typically semisolid formulations such as creams or gels.

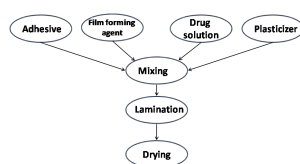
Aim of the work

The objective of this work was to formulate the transdermal bioadhesive film named Patch-non-Patch® with ibuprofen and to study the effect of penetration enhancers and occlusion on the permeation of the drug across pig ear skin. A commercial gel containing 5% of ibuprofen was used as reference.



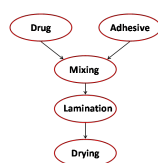
Methodology

Film preparation



All the mixtures prepared were laminated at 600 µm on siliconized paper and dried in oven at 80°C for 30 minutes.

Drug In Adhesive patch preparation



The solution was laminated at 600 µm on occlusive or non-occlusive backing and dried in oven at 50°C for 10 minutes.

Composition of the formulations tested

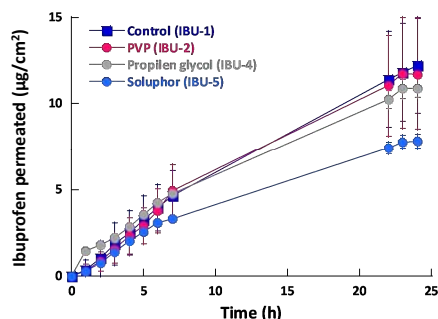
	IBU 1	IBU 2	IBU 3	IBU 4	IBU 5	DIA
PVA 150	20	10	10	10	10	-
Plastisol F 25 H	20	20	20	20	20	-
EtOH	-	-	10	-	-	-
PVP K30 H	-	4	-	-	-	-
Propylene glycol	-	-	10	4	-	-
Water	12.6	12.6	8.3	12.6	12.6	-
IBU	1.0	1.0	1.0	1.0	1.0	1.0
Durotak 87-2077	-	-	-	-	-	50
DRUG CONTENT						
µg/cm ²	411.00012746	626.04116720	156.20292877	411.9614128	440.6201573	1065.0289
mg	11.810185	18.131818	4.611188	12.04138	13.020185	31.051818
%	5.140137	8.620109	2.050118	5.280144	5.520108	9.691168
(a) 25% water solution (50%) (b) 25% water solution (50%)						

Permeation experiments

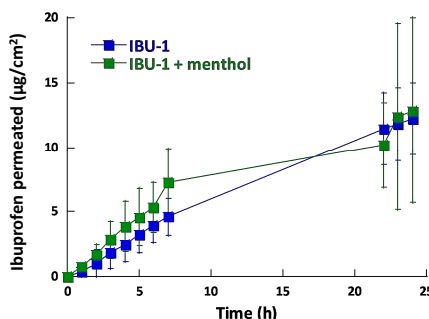
- Franz diffusion cells
- Membrane: pig ear skin
- Receptor solution: Phosphate Buffer Solution pH 7.4
- Temperature: 37°C
- Donor:
 - Patch-non-Patch® applied with know amount of water (15µl/cm²)
 - Patch-non-Patch® applied with know amount of 10% menthol in water:EtOH solution (1:1, v/v) (15µl/cm²)
 - DIA systems
 - Commercial formulation applied in finite dose conditions (10 mg/cm²)

Results

Effect of enhancers on the permeation of ibuprofen from IBU films (Mean values±DS)



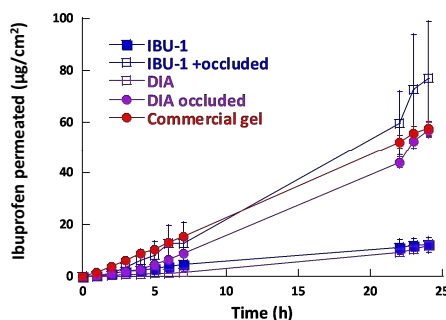
Effect of menthol on the permeation of ibuprofen from IBU-1 film (Mean values±DS)



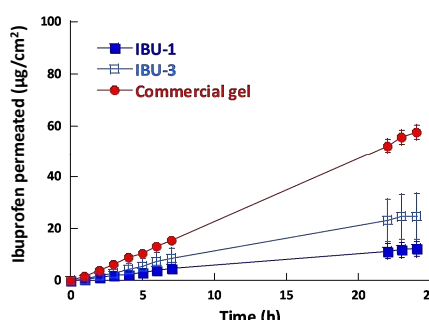
The introduction of penetration enhancers in the film did not modify neither the permeation kinetics nor the amounts permeated.

The same result was obtained in the case of the film applied with the solution containing menthol.

Effect of occlusion on the permeation of ibuprofen from IBU-1 film and DIA (Mean values±DS)



Effect of concentration of drug and combination of penetration enhancers on the permeation of ibuprofen from IBU films (Mean values±DS)



The application of an occlusive backing on the film determined a significant increase of the amount of ibuprofen permeated. The permeation profile obtained was the same as that obtained from the commercial formulation applied in finite dose conditions. The same trend was observed in the case of DIA system.

The increase in ibuprofen concentration and the contemporary presence of two penetration enhancers determined an increase in the permeation profile of ibuprofen compared with the film IBU-1 even if the amounts permeated are lower than that obtained from the commercial formulation.

Conclusions

The bioadhesive film proposed is a promising alternative to the existing formulations for dermal and/or transdermal administration of ibuprofen.

Among all penetration enhancers tested, only skin occlusion seem to be effective in promoting drug transport across the skin.

Bibliography

- [1] P. Colombo, P.L. Catellani, C. Padula, P. Santi, G. Colombo, Film for dermal and transdermal administration of drugs, WO02/30402, April 18, 2002.
- [2] <http://patchnonpatch.awardspace.com>.

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