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A COMPARISON OF PVP, PEG6000, PVA AS PENETRATION ENHANCES FOR PARACETAMOL TRANSDERMAL DRUG DELIVERY SYSTEM

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ABSTRACT

Paracetamol is analgesic & antipyretic agent, mostly used for children & infants. The main aim of this research is the children who are unable to take medicine in different dosage forms like tablets, capsules & syrups etc, TDDS is a suitable route for administration of drug. The half-life of a drug is 1-4 hours which makes it suitable for TDDS. Transdermal patches are prepared by solvent casting method using starch as a polymer. The main object of this study is to compare the individual effect of penetration enhancers on Paracetamol TDDS. Prepared patches are evaluated for thickness, Folding endurance, drug content, Invitro penetration study was performed by using Franz diffusion cell.

KEYWORDS: Paracetamol, Starch, PVP, PEG6000, PVA, Solvent casting method.

INTRODUCTION

The TDDS formulated by considering 3 factors drug, skin & vehicles. The components of the system include the drug dissolved or dispersed in an inert polymer matrix that provides support and platform for drug release.[1] Most of the drug substances will not diffuse in to the skin at sufficient rates to obtain therapeutic concentration. Penetration enhances other substances that reduce the skins ability to perform its barrier function. This substances make the skin more permeable and they allow drug molecules to cross the membrane at faster rate.[3] The advantages of TDDS are to avoid first-pass metabolism, substitute for oral administration, avoiding inconvenience of parenteral therapy, easily terminated the action removal of patch, drugs with narrow therapeutic window can be formulated in to TDDS. The purpose of this work is to evaluate the effects of different penetration enhances using PVP, PEG6000 & PVA on Paracetamol drug.[2]

MATERIALS AND METHODS

Materials

Paracetamol from Gautham College of Pharmacy.

Starch

PVP

PEG6000

PVA

Methods

Preparation of Paracetamol patch

Patches are prepared by using solvent casting method. Petridish with area 35.25cm^2 was used. Polymers were weighed accurately and dissolved in 10ml of methanol & water (1:1) kept aside to form clear solution. 50mg of drug added to the all formulation. PEG6000 (20% w/w of total polymer), PVP (10% w/w of total polymer), PVA (30% w/w of total polymer) used as penetration enhancers. The solution was poured on the Petridish which is lubricated with glycerin & dried at room temperature for 24hours. An inverted funnel places over the Petridish to prevent evaporation of the solvent. Patches are stored in decicator.[6]

Table 1: Formulation.

Batch No	Polymer	Proportion	Solvent
1	Starch : PVP	1:1	Methanol & Water
2	Starch : PVA	1:1	Methanol & Water
3	Starch : PEG6000	1:1	Methanol & Water
4	Starch : PVP:PEG6000:PVA	1:1	Methanol & Water

Evaluation

Thickness: Measured by using digital micrometer screw gauge at three different places. Average was calculated.[4]

Tensile strength: Determined by pulling system using hands. The elongation i.e. distance travelled by the pointer before break is noted from the graph paper.

Folding endurance: Determined by repeatedly folding one film at same place till it broke. Repeat the process without breaking the no of times the folding gave the value of folding endurance.[5]

Table 2: Evaluation Parameters.

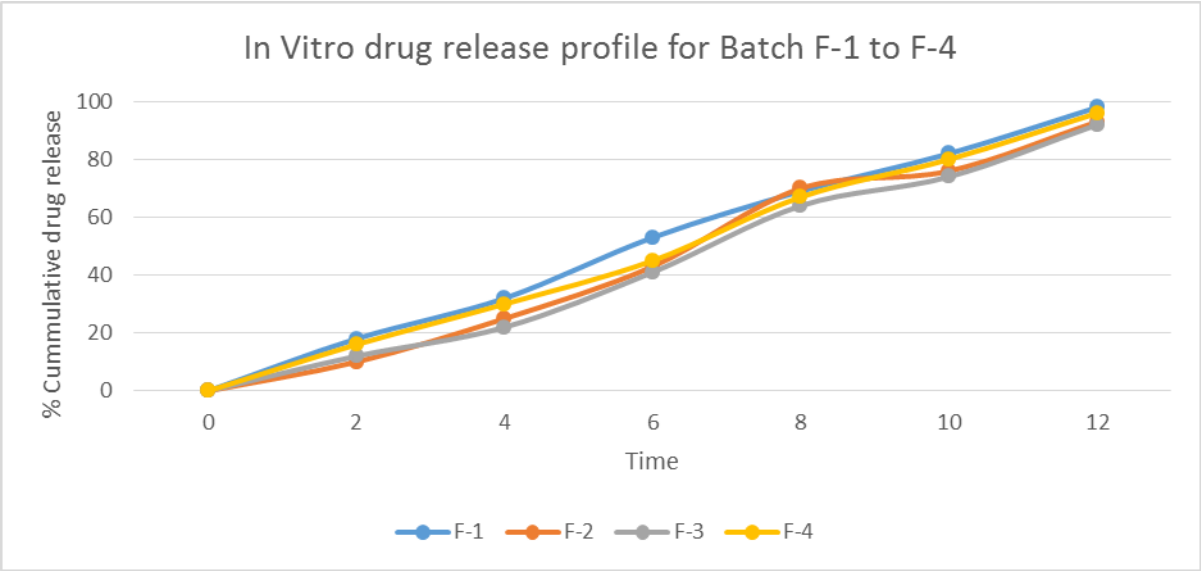
Batch	Parameters	F-1	F-2	F-3	F-4
1	Thickness	0.11	0.10	0.11	0.12
2	Tensile Strength(kg/cm^2)	21	20	21	11
3	Folding endurance	63	71	68	40
4	Drug content (% drug release)	98	93	92	96

Drug content

Patches of specified area (1 cm^2) were dissolved in 5mL of dichloromethane and the volume was made up to 10mL with phosphate buffer pH 7.8; dichloromethane was evaporated using a rotary vacuum evaporator at 45°C. A blank was prepared using a drug-free patch treated similarly. The solutions were filtered through a 0.45µm membrane, diluted suitably and absorbance was read at 249 nm in a double beam UV-Vis spectrophotometer.

In Vitro Drug Release Studies

In Vitro drug release studies were performed by using a Franz diffusion cell with a receptor compartment capacity of 60mL. The cellulose acetate membrane was used for the determination of drug from the prepared transdermal matrix-type patches. The cellulose acetate membrane having a pore size 0.45μ was mounted between the donor and receptor compartment of the diffusion cell. The prepared transdermal film was placed on the cellulose acetate membrane and covered with aluminum foil. The receptor compartment of the diffusion cell was filled with phosphate buffer pH 7.8. The whole assembly was fixed on a hot plate magnetic stirrer, and the solution in the receptor compartment was constantly and continuously stirred using magnetic beads, and the temperature was maintained at 32 ± 0.5°C, because the normal skin temperature of human is 32°C. The samples were withdrawn at different time intervals and analyzed for drug content UV-Visible spectrophotometer. The receptor phase was replenished with an equal volume of phosphate buffer at each sample withdrawal.



RESULTS AND DISCUSSION

The results from evaluation of patches from Table 2. The thickness for F-1 is 0.11, F-2 is 0.10, F-3 is 0.11 & F-4 is 0.12. This indicates that Paracetamol patches prepared from different penetration enhancers shows similar thickness. F-4 shows more thickness than other formulation. Good uniformity of drug content among the formulations, F-1 shows good drug content uniformity. Folding endurance indicate that patches would not break and remain their integrity with general skin folding.

In-vitro skin permeation

The *in-vitro* release profile is an important tool that predicts in advance how a drug will behave in vivo. The results of *in-vitro* skin permeation studies of Paracetamol from transdermal patches are shown in Graph. In the present study penetration enhancers & polymer (starch) are used to prepared patches. Formulation F-1 shows greatest 98% of drug release value, while formulation F-3 shows lowest 92% of drug release value.

CONCLUSION

A comparison of PVP, PEG6000 and PVA as penetration enhances for Paracetamol transdermal were prepared. All formulation also showed good physicochemical properties like thickness, drug content, and folding endurance. The *in-vitro* release data showed that drug release from the patch formulation have been affected by different penetration enhancers and polymer. Effect of penetration enhancer like PVP, PEG6000, and PVA have been checked on *in-vitro* permeation of drug. These studies indicated that as the different penetration enhancers increased drug permeation. From the results paracetamol with PVP

shows good penetration than PEG6000 and PVA. The finding of this result revealed that the problems of Paracetamol on oral administration like dissolution rate limited absorption and gastric side effects can be overcome by applying Paracetamol topically in the form of transdermal patch.

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