

The Development of Transdermal Piroxicam Using HPMC Matrices With PVP K-30 as a Penetration Enhancer

Ni Luh Dewi Aryani

Faculty of Pharmacy, University of Surabaya
Jl. Raya Kalirungkut, Surabaya, Indonesia

Abstract

The physicochemical properties such as solubility, partition coefficient, and membrane permeability of a drug are required for formulating and estimating drugs absorption that pass through biological membranes. The research studied about solubility, partition coefficient in octanol-phosphate buffer, rabbit skin permeability and release from the transdermal delivery system of piroxicam with addition of 6% PVP K-30 *in vitro* into phosphate buffer solution pH 7.4 at temperature $32^{\circ} \pm 1^{\circ}\text{C}$. The results showed that the solubility of piroxicam was $904.44 \pm 20.92 \mu\text{g/mL}$. The values of log IPC and APC were 1.99 ± 0.01 and 0.08 ± 0.01 , respectively. The flux, permeability coefficient, and diffusion coefficient of the piroxicam permeation process were $2.07 \times 10^{-4} \mu\text{g/cm}^2/\text{sec}$, $4.96 \times 10^{-6} \text{ cm/minute}$, and $4.13 \times 10^{-8} \text{ cm}^2/\text{minute}$, respectively. The release mechanism of piroxicam from transdermal delivery system was more dominant by diffusion than erosion. The fluxes of piroxicam release were 0,169 and 0,107 $\text{mg/cm}^2/\text{minute}$ for formulation with 2% HPMC and 4% HPMC, respectively.

Keywords: Piroxicam, HPMC, PVP K-30, Transdermal delivery

1. Introduction

Piroxicam is a nonsteroid antiinflammation drug (NSAID) which is often used in rheumatoid arthritis treatment. It is like other NSAIDs, piroxicam provides side effects in gastrointestinal. Thus, transdermal delivery system is an attractive option to overcome this problem. Piroxicam was reported that had poor skin permeability. So that was suggested to enhance the skin permeability with a penetration enhancer (1-4).

Skin is largest organ of the body, is composed of several layers: the stratum corneum (uppermost layer), viable epidermis, dermis and hypodermis. One commonly hears that the skin is too good barrier to permit the delivery of all but a few compounds. Low skin permeability originates from unique hierarchical structure of the stratum corneum. Stratum corneum consists of several layers of keratinocytes within which lipid bilayer are stacked (5-7). Hence, the attempts have been made to circumvent this barrier by using "penetration enhancer", i.e., compounds which would temporarily and reversibly diminish the barrier function of the stratum corneum and make possible percutaneous absorption of drugs. Penetration enhancer should be nontoxic, pharmacological inert, nonirritant, non-alergenic, reversible, pharmaceutical stable, cosmetically acceptable (8-11).

One of the penetration enhancer is polyvinylpyrrolidone (PVP). PVP is the pyrrolidones, which the primary site of action is most likely the polar route, and there intrinsic humectant activity, is a significant factor in their little doubt that hydration of the skin, owing to their effectiveness (12)

The skin permeability of drugs with certain polarity depends on the skin/vehicle partition coefficient. It is not easy to measure skin/vehicle partition coefficient of permeant. Hence, it is usually used partition coefficient octanol/water instead. Partition coefficient octanol/water is lipophilicity parameter of drugs. It is an important factor to determine permeability of drug across biological membranes (13, 14). Beside the partition coefficient, the skin permeability of drugs depends on solubility of drugs also (14, 15).

Beside the physicochemical properties, the release rate of the drugs is also required for formulating and estimating drug absorption pass through biological membranes. The release rate of the drugs is influenced by the dosage form (16). The research studied about solubility, partition coefficient in octanol-phosphate buffer, rabbit skin permeability and the release from the transdermal delivery system of piroxicam with addition of 6% PVP K-30 *in vitro*. In this study, the transdermal delivery system developed by using hydroxylpropyl-metilcellulose (HPMC).