$$K_o = -Cl_o \times C_p$$

$$J_s = \frac{K_o}{\text{Size}_{\text{patch}}}$$

where K_o is the target in vivo Drug delivery rate (mg/hr); Cl_o is the total body clearance; C_p is the target steady-state plasma concentration, and J_s is the steady-state skin flux (22).

2.3. Evaluation of Transdermal Drug Delivery Kinetics

To evaluate the efficacy of the TDDS systems, in vitro and in vivo analyses are performed. In vitro studies are then correlated with the in vivo data.

2.3.1. In vitro Drug Release Kinetics

For in vitro studies, human cadaver skin is preferred for the evaluation of drug permeation profiles. Since human cadaver skin is difficult to obtain and very expensive, other alternatives such as hairless mouse skin, guinea pig skin, Epiderm®, and other bio-engineered human skin equivalents are used. The release and skin permeation kinetics can be evaluated using a two-compartment diffusion cell assembly. This is carried out by individually mounting a skin specimen excised from either a human cadaver or other animal, on a diffusion cell. The experiment involves placing the drug-releasing surface of the transdermal delivery system on the skin in intimate contact with the stratum corneum surface, and mounting this in the diffusion cell assembly. Samples are collected from the receiver solution at predetermined time intervals until a steady-state flux is established. Samples are assayed for drug concentration and the concentration data are modeled for diffusivity characteristics. Published examples of utilizing these technologies can be found in Refs. 28 and 29.

2.3.2. Animal Models

The in vivo transdermal permeability of drugs depends on the animal species from which the skin is obtained. The reader is advised to read the review article by Panchagnula et al. (30). The authors presented the permeability differences of a polar and non-polar drug through the skin of 16 animal species including humans.

3. NASAL DRUG DELIVERY

Over the past two decades, intranasal drug delivery has shown tremendous promise for systemic delivery of therapeutic agents, although the potential of the nose as a route of administration has been known since ancient time. Psychotropic and hallucinogenic agents have been used as snuff in many