INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

A Review on the Painless Control-Release Approach to Smoking Cessation: Transdermal Nicotine Patches

Vedant Deshmukh*, Rimzim Paryani, Dr. Raju Thenge, Eknath Kolte, Sagar Chaudhari

Dr Rajendra Gode College of pharmacy malkapur

ARTICLE INFO

Published: 15 Apr. 2025
Keywords:
Nicotine, stratum corneum, Transdermal drug delivery system, Transdermal patch, Nicotine, smoking cessation, controlled release.
DOI:
10.5281/zenodo.15225330

ABSTRACT

Transdermal drug delivery system delivers the drug to the skin outermost layer as a site of administration. as self-administration is possible and it has large number of advantages it reduces the need of frequent dosing as a single patch can be used to deliver the drug for up to 24hr.as controlled and predictable manner so causes no worry to patient if he/she forget to take the drug. Due to its increase patient compliance the demand of TDDS is increasing with time and is play the important role in the smoking cessation.

INTRODUCTION

Nicotine (NCT), a pyridine alkaloid derived from tobacco plant, is one of the most effective substances for controlling a smoking addiction. It is a colourless volatile liquid, that can also suffer oxidation and become yellow or brown when exposed to air or light. It is miscible with water and is also solubilized in hydrophobic solvents. Because it is highly lipophilic, it is easily absorbed and permeates through the skin when applied topically, and it can also cross the blood-brain barrier.[1]

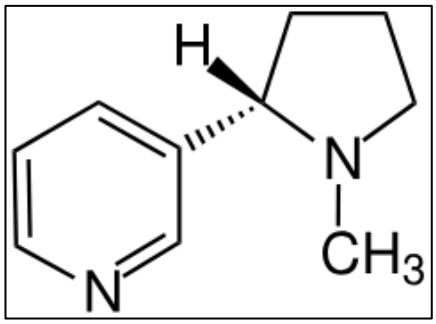

Fig 1: chemical structure of nicotine.

Nicotine is a suitable candidate for transdermal patch because it is volatile, highly lipid soluble, and permeates the skin easily. [2] Nicotine replacement therapy (NRT) is widely used to

***Corresponding Author:** Vedant Deshmukh
Address: *Dr Rajendra Gode College of pharmacy malkapur.*
Email ✉: vedantad2003@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

elevate the effects of nicotine withdrawal during smoking cessation. Various forms of NRT (chewing gums, transdermal and transmucosal patches, nasal sprays and inhalers) have been developed and clinically validate [2] Transdermal drug delivery system (TDDS), also known as patches. is one of the systems lying under the category of controlled drug delivery, in which the aim is to deliver the drug through the skin (**stratum corneum**) in a predetermined and controlled rate. In order to deliver therapeutic agents through the human skin for systemic effects, the comprehensive morphological, biophysical and physicochemical properties of the skin are to be considered. [3] Drugs given by this route must be potent with a daily dose should be low few mg/days. The half-life (t1/2) of the drug should be short. The drug must not induce allergic response it should be compatible with the skin. Drugs which degrade in the GI tractor which are inactivated by hepatic first-pass effect are suitable candidates for transdermal delivery.[4] One significant implication of Perkins's (1996) hypothesis is that Nicotine Replacement Therapy NRT might work better for males than for women; in other words, it should be a more effective smoking cessation method for men.[5]

1.1] Basic components of TDDS include polymer matrix, membrane, drug, penetration enhancers, pressure sensitive adhesives, backing laminates, release liner, etc [6]

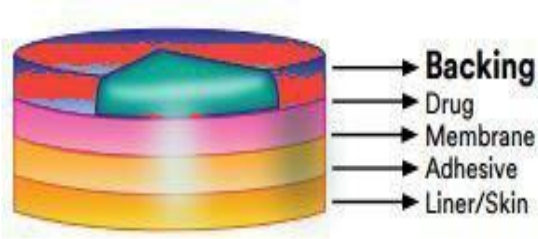

Fig 2: drug reservoir type transdermal patch.

1. Drug: Drug should be compatible with the skin not-irritable to skin. Drug is in direct contact with release liner. Ex: Nicotine, lidocaine, captopril HCL and testosterone, estrogen etc.
2. Liners: Protects the patch during storage also helps to prevents the contamination. Ex: polyester film, Teflon, silicones.
3. Adhesive: also known as pressure sensitive adhesive, serves to adhere the patch to the skin for systemic delivery of drug. Ex: poly Acrylates, Polyisobutylene based adhesives (PSA), Silicones.
4. Permeation enhancers: they work by enhancing the transdermal permeation. Ex: Terpenes, Terpenoids, Pyrrolidines. Solvents like alcohol, Ethanol, Methanol. Anionic Surfactants like Sodium Lauryl sulphate SLS, ammonium sufate Pluronic F127, Pluronic F68, Oleic acid
5. Backing layer/laminate: provide support prevent the drug release from the dosage form through top. Protect patch from outer environment. Ex: Cellulose derivatives, poly vinyl alcohol, Polypropylene Silicon rubber.

1.2] Basic principles of transdermal permeation:

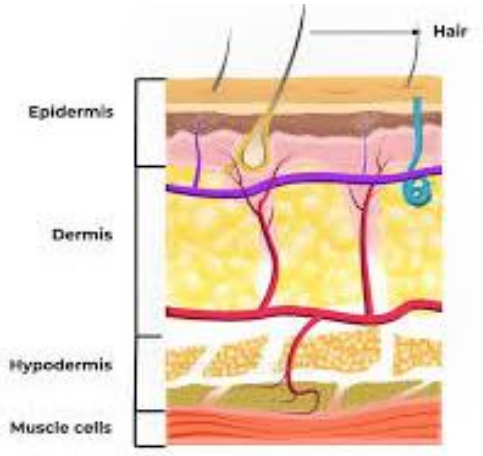

Fig 2:structure of skin

Transdermal permeation is based on passive diffusion through skin epidermis layer. In order for a drug applied topically to produce a local or systemic effect, it must penetrate the stratum corneum (SC) – the permeability barrier of the skin. During the initial transient diffusion phase

drug molecules may enter the skin by penetrating through the hair follicles or sweat ducts and subsequently absorbed through the follicular epithelium through the intact stratum corneum becomes the main route for transdermal permeation. Delivery of a therapeutic agent from a topical preparation onto the skin surface and to the systemic circulation is a multi-step process, which includes:

1. Dissolution with in and release from the formulation
2. Segregation to the outer layer of the skin, the stratum corneum[6]

1.3] Advantages of transdermal drug delivery systems: [7]

a. By pass first pass metabolism by liver.
b. decrease the fluctuation in drug levels
c. Avoidance of gastro intestinal incompatibility by acid.
d. Provides utilization of drugs with short biological half-lives and narrow therapeutic window drugs.
e. Predictable and controlled duration of activity.
f. Minimizing undesirable side effects.
g. Improving physiological and pharmacological response
h. Increase patient compliance due to Provide suitability for self-administration and reduce dosing.

1.4] Limitations of transdermal drug delivery systems:

a. Drug of drug formulation may cause irritation to the skin.
b. When the drug undergoes significant skin metabolism and the molecular size is large enough to stop the molecules from permeating the skin's outer layer.
c. Unsuitable for a drug that lacks an optimal o/w partition coefficient.
d. The skin's barrier properties vary according to age, from person to person, and within the same individual.

HABIT :

Habit is a key in keeping tobacco smoking, the average smoker receiving 200 puffs a day (20 cigarettes X 10 puffs/cigarette). More than 40 years of smoking is equivalent to 2.9 million puffs.The frequent occurrence of this behavior pairs smoking including many activities and events daily. The combination of the beneficial effects of smoking with repeated association dependent learning. hence Nicotin Transdermal Drug Delivery Patches are used to help patients break their habits. and plays a significant part in smoking cessation. And to get rid of smoking [8].

REFERENCES

1. W. Pichayakorn, J. Suksaeree, P. Boonme, T. Amnuaikit, W. Taweepreda, and G. C. Ritthidej, “Nicotine transdermal patches using polymeric natural rubber as the matrix controlling system: Effect of polymer and plasticizer blends,” J. Memb. Sci., vol. 411–412, pp. 81–90, 2012, doi: 10.1016/j.memsci.2012.04.017.
2. S. Davaran, M. R. Rashidi, R. Khandaghi, and M. Hashemi, “Development of a novel prolonged-release nicotine transdermal patch,” Pharmacol. Res., vol. 51, no. 3, pp. 233–237, 2005, doi: 10.1016/j.phrs.2004.08.006.
3. V. Rastogi and P. Yadav, “Transdermal drug delivery system: An overview,” Asian J. Pharm., vol. 6, no. 3, pp. 161–170, 2012, doi: 10.4103/0973-8398.104828.
4. J. Suksaeree, P. Boonme, W. Taweepreda, G. C. Ritthidej, and W. Pichayakorn, “Characterization, in vitro release and permeation studies of nicotine transdermal patches prepared from deproteinized natural rubber latex blends,” Chem. Eng. Res. Des.,

vol. 90, no. 7, pp. 906–914, 2012, doi: 10.1016/j.cherd.2011.11.002.

5. D. W. Wetter, M. C. Fiore, T. B. Young, J. B. McClure, C. A. de Moor, and T. B. Baker, "Gender differences in response to nicotine replacement therapy: Objective and subjective indexes of tobacco withdrawal.," Exp. Clin. Psychopharmacol., vol. 7, no. 2, pp. 135–144, 1999, doi: 10.1037//1064-1297.7.2.135.
6. A. G. Galge and D. Pagire, "A Review on Transdermal Patches," Int. J. Res. Publ. Rev., no. January 2010, pp. 1810–1824, 2022, doi: 10.55248/gengpi.2022.3.10.60.
7. A. Alexander et al., "Approaches for breaking the barriers of drug permeation through transdermal drug delivery," J. Control. Release, vol. 164, no. 1, pp. 26–40, 2012, doi: 10.1016/j.jconrel.2012.09.017.
8. A. V. Prochazka, "Medical approach to smoking cessation," Semin. Respir. Crit. Care Med., vol. 17, no. 4, pp. 289–297, 1996, doi: 10.1055/s-2007-1009901.

HOW TO CITE: Vedant Deshmukh*, Rimzim Paryani, Dr. Raju Thenge, Eknath Kolte, Sagar Chaudhari, A Review on the Painless Control-Release Approach to Smoking Cessation: Transdermal Nicotine Patches, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 4, 9214-9217. https://doi.org/10.5281/zenodo.15225330