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A Comprehensive Overview of Herbal Transdermal Patch

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ABSTRACT

Pharmaceutical businesses are currently showing a high level of interest in drug delivery technology. The fundamental goal of developing alternative medication delivery systems is to improve drug efficiency and safety while also providing better convenience for patients. Extensive research undertaken over the last few years has resulted in the development of technologies that meet the requirements for administering the medicine in a non-invasive manner. One such technology is transdermal medication delivery. A transdermal patch is a medicated adhesive pad that releases the active ingredient gradually over a period of many hours to days after application to the skin. Drugs obtained from herbal sources have been shown to be more effective when put into transdermal medication patches. Herbal transdermal patches are now available to help with a variety of purposes, including quitting smoking, reducing stress, enhancing sexual health, repelling insects, aiding detoxification, boosting male energy, and delaying menopause. Some herbal penetration enhancers, such as specific terpenes, have also shown effectiveness in replacing traditional enhancers like DMSO (Dimethyl Sulfoxide), which has several disadvantages. This review aims to focus on the delivery of various herbal agents through the transdermal route.

Key Words: Transdermal Drug Delivery, Medicated Patches, Herbal Agents.

Introduction

Transdermal delivery is a straightforward technology to implement. The primary obstacle to drug penetration through the skin is the stratum corneum, the outermost layer of the epidermis. This layer is composed of flattened, keratinized remnants of once-dividing epidermal cells. It is hygroscopic but water-impermeable, functioning as a strong, flexible membrane. The intercellular spaces within this layer are rich in lipids. While the stratum corneum is typically around 10 microns thick, it can reach up to 600 microns on the palms and soles. Despite being an effective barrier, certain chemical compounds can penetrate it and reach deeper tissues and blood vessels. These compounds tend to have low molecular weight (less than 500 Da), high lipophilicity, and are effective even in small amounts.Transdermal absorption takes place through a gradual diffusion process, driven by the concentration difference between the high concentration in the delivery system and the near-zero concentration in the skin. Therefore, the delivery system needs to remain in constant contact with the skin for an extended period, ranging from hours to days.

General method of preparation :

- Herbs are put in a jar and a spirit of 40% pure ethanol is added (80 proof Vodka, for example)
- The jar is left to stand for 2–3 weeks, shaken occasionally, in order to maximise the concentration of the solution.

To make a more precise tincture, more extensive measuring can be done by combining 1 part herbs with a water-ethanol mixture of 2-10 parts, depending on the herb itself. With most tinctures, however, 1 part water at 5 parts ethanol is used.

METHOS OF PREPARATIONS OF PATCHES :

Method 1).

PVA, PVP were used as the skeletal material of preparation, Glycerol as humectant and plasticizer, Azone and propylene glycol as penetration enhancer. Polyacrylic resin pressure-sensitive adhesives (PSAs) are materials that adhere to a substrate by application of light force and leave no residue when removed. Pressuresensitive adhesives are also important components of transdermal drug delivery systems (TDDS), because they ensure intimate contact between the drug-releasing area of a TDDS and the skin surface, which is critical for controlled release of the drug (Yoshinori *et al.*, 2005).

Method 2)

PVA (1 g) and PVP (1g) were weighed in requisite ratios and mixed in 10 ml distilled water, stired the mixture over a hot water bath until dissolved. After the mixture was cooled down to 25 Ž, added Sinomenine (0.3 g) , propylene glycol (0.5 ml), glycerol (0.5 ml), azone (0.3 ml) and the pressure-

sensitive adhesives (2 ml), mixed together using a mechanical stirrer (IKA, RW16, Germany) at 800 rpm for 15 min under occluded condition (Paola *et al*., 2003) . The mixture was then cast on the release liner with a micrometer adjustable casting knife (R. K. Coat Instruments, UK) set at 500 µm, and was dried at 80°C for 25 min. The total area of one formulation is about 300 cm2. The patches were covered with backing laminate and cut into appropriate sizes. Drug loading for Sinomenine was about 1 mg per cm2

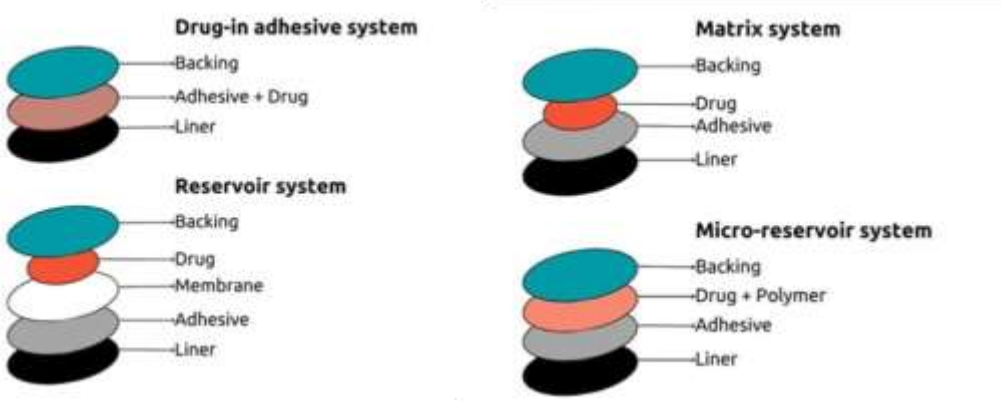

Fig.1 Types of transdermal patches.

STABILITY TEST :

1. Centrifugal test

10 g of transdermal CHM agent was put into the centrifuge tube with a scale, centrifuged 3000 r/min for 30min, while observing whether there is the phenomenon of layering and emulsion breaking.

2. Cold and heat test

The transdermal CHM agents were placed in test tube with plug, kept in a 55°C incubator for 6 h and -15°C refrigerator for 24 h to observe whether the layered, demulsification, mildew, as well as color and uniformity of change occurs (Wu et al., 2008).

3. Accelerating test

The transdermal CHM agents were placed in test tube with plug, kept for three months in a constant temperature incubator of temperature (40 ± 2 Ž) and relative humidity of 75% to observe whether the stratification, demulsification, mildew, as well as color, uniformity of change occurs(Wu et al., 2008).

4. In vitro diffusion

Skin treatment

The abdominal skin of mice was employed with the subcutaneous fat tissues being removed, soaked in saline and kept in 4°C refrigerator for further use.

EVALUATION OF MEDICATED PATCHES :

1) Weight Variation Test :

The study was carried out on 9 films obtained from 100ml of casting solution. The mean weight of the film as well as the deviation from the mean was obtained.

2) Measurement of film thickness:

The study was carried out on 5 randomly selected films. The thickness of two glass slides held together was recorded first with the help of a micrometer screw gauge ; the films were placed Between the two glass slides and the thickness was measured at 5 different points and the mean values were calculated. The data for thickness measurement is recorded .

3) Hardness Determination:

The apparatus employed for hardness determination consisted of a sharp needle 12cm long, 2mm thick and tapering to form a pointed end between 11th and 12th cm, passing down a wooden mechanical frame. The sharp pointed end of the needle rested on a flat surface with metal lining. The upper blunt end of the needle was connected to a circular wooden plate on which increments of weights could be placed. The upper part of the needle was connected to an electric wire continuous with two 1.5-volt batteries and a threevolt electric bulb and the circuit was completed by connecting the wire to the metal plate above which the film is placed. The sharp end of the needle rested on the film. Increments of weights were added on to the surface of wooden plate and when the hardness of the film is exceeded, the sharp end.

4) Determination of folding endurance:

A film of 5.5 cm x 3 cm dimension was used in each case. The film to the extent of 0.25 cm was fixed on either side with the help of metal clips. Folding of the film was accomplished by two aluminum L – clamps held in position by the metal clips which, when come closer together, gently press the film along the vertical direction and guide the film to fold upwards. While one of the clips remained stationary, the other metal clip was made to move to and fro by means of a piston connected eccentrically to a rotating wheel with a variable speed regulator. The number of rotations (counts) executed at a fixed speed to break the film was recorded. The average values of 5 such runs for folding endurance for patche. The assembly for folding endurance determination is displayed in Fig.2

Figure 2. Apparatus for determination of folding endurance of the Patch.

5) Determination of drug content:

The drug content was estimated by diazotization reaction of salbutamol sulphate and subsequent coupling with Para nitro aniline in alkaline solution. The resulting colour intensity was measured at 485 nm against a reagent blank. The chromophore obeys Lambert – Beer law in the concentration range of 1 - 8 µ gm/ml of salbutamol sulphate. The average data for three determinations of drug content in the films are recorded.

USE OF HERBAL TRANDERMAL THERAPY:

There are different patches that are available to lose weight, quit smoking, help to relieve stress and even increase sexuality, insect repellant patches, detoxification, male energizer, better sleeping, postpone menopause etc.

1. Anti-smoking patch

The anti-smoking patch is a groundbreaking aid designed to help you quit smoking safely and naturally, without introducing additional nicotine into your system. Featuring a unique combination of ingredients, the nicotine-free patches provide the best opportunity to break the habit for good. These patches are applied to your skin and deliver a controlled amount of nicotine into your body.

2. Kick the nicotine habit naturally

The zero nicotine patch is safe and easy to use. Each patch contains a dose of potent herbal ingredients specifically formulated to ease nicotine withdrawal symptoms while detoxifying the body of smoking-related toxins. To successfully quit smoking, you must free yourself from nicotine. Zero nicotine's all-natural formula contains no nicotine, working to reduce rather than restore nicotine levels in your body, helping you break the habit. When used alongside a proven cessation program, zero nicotine can help you quit tobacco in 30 days or less. Nicotine withdrawal is widely known to be unpleasant, and it is often the reason even the most determined quitters relapse. Researchers have developed a method to combine natural herbal remedies that completely and naturally eliminate your body's craving for nicotine. The ingredients in the anti-smoking patch include Gotu Kola, Hops, Skullcap, Oat, Peppermint, Ginger, Gentian, Myrrh, Safflower, Eucalyptus, Licorice Root, Sarsaparilla, and Bayberry.

3. Herbal body detox foot patch

The bodies detox foot patches are based on molecular reform therapy.

Molecular reform therapy has four major components.

1) Detoxification- To remove waste and toxins from the body. (Non digestive and other chemical toxins must be eliminated from the body)
2) Increasing Oxygen intake- to enhance metabolism
3) Balance Nutrition - To supply the body with all essential nutrients (Need 49nutrients daily to perform the proper function.)
4) Heath Regulation - To promote mental heath and health restoration.

According to Chinese medical knowledge, our human body has over 360 acupuncture points, with more than 60 acupuncture points found on the soles of the foot. Known as the “second heart”, these are the reflex zones of our internal organs, and potential homes for toxins. When the blood circulates to the soles, the Detox Foot Patch can absorb toxins released from the acupressure points. Circulation of blood and lymphatic fluids reach their furthest point in the soles of the feet before being return 'pumped' back up into the higher portions of the body. Unfortunately in today's society, seemingly too much of our time is spent perusing sedimentary activities. This can lead to circulatory dysfunction and an inhibited flow of the lymphatic fluids in the body (the lymphatic system in fact has no pumping organ like the circulatory system, and thus relies upon sufficient motion and bodily activity to precipitate fluid motion) as they begin to accumulate in the ankles and lower legs due to gravity . The body detox foot patch contains all natural ingredients, which are described as below:- Bamboo Vinegar, Wood Vinegar, Tourmaline, Eucalyptus.

4.Herbal anti-rheumatic patch

Rheumatic diseases have been a significant health concern for centuries and remain among the most prevalent inflammatory conditions, particularly in developing nations. Rheumatoid arthritis (RA) serves as a prominent example of these conditions and is a major contributor to disability. RA is characterized as both an extravascular immune complex disorder and a cell-mediated immune dysfunction, leading to chronic inflammation, granuloma formation, and joint destruction. The pathogenesis of RA is influenced by a range of complex and multifactorial factors, including genetic predisposition, rheumatoid factor (circulating antibodies), immune complexes, complement activation, lymphocyte involvement, arachidonic acid metabolites, and free oxygen radicals.

At present, synthetic pharmacological agents constitute the primary therapeutic approach for arthritis. Conventional treatment modalities encompass analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), disease-modifying anti-rheumatic drugs (DMARDs), and corticosteroids, each targeting distinct aspects of the underlying pathogenic mechanisms. A notable challenge in managing RA, particularly among elderly patients, is medication non-adherence, often exacerbated by the concurrent management of other chronic health conditions requiring additional pharmacological interventions.

Transdermal drug delivery presents a promising alternative, demonstrating improved patient adherence. This method involves the topical application of pharmacological agents to intact, healthy skin, facilitating either localized treatment or systemic therapeutic effects. The primary goal in the formulation of transdermal systems is to optimize the flux of the active drug through the skin into the systemic circulation, while simultaneously minimizing its retention and metabolic degradation within the skin. Notably, the active constituents utilized in anti-rheumatic herbal patches include Boswellic acid and Curcumin, which are recognized for their therapeutic potential in managing RA symptoms.

5.Herbal cholesterol patch

Transdermal Patches contain a very small dose which is slowly delivered directly into the blood stream over a 24 hour period. This is the most efficient method of delivery of Vitamins and Nutrition to the body as compared to Tablets and Capsules which must first travel through the digestive system before reaching the blood stream. It is applicable to helps lower Cholesterol, Triglycerides, LDL, Lp (a) lipoprotein, and raise HDL. Side effects like flushing due to high dosage Niacin are absent when applied through Transdermal Patches without any loss in potency or efficiency. About 90% of Vitamins and Minerals being water soluble are immediately excreted from the body by way of urine after traveling through the digestive system and are therefore wasted. Those of us who have taken B-Complex have seen our urine become yellow in color within half an hour of taking an oral dose. It is the balance approximately 10% that actually reach the blood stream and are used as nutrition to be delivered to the center of the cell where it is really required. Cholesterol patches work best when taken with nutritional supplement organic magnesium on a daily basis.

In short, one can roughly equate one 50mg Transdermal Patch to about a 500mg Oral dose taken two to three times a day in actual effectiveness but without the discomfort associated with oral intake.

The main ingredients used in herbal cholesterol patch are Vitamin B-Complex 5mg, Niacin 20mg, Organic Vitamin C 20mg, Commiphora Mukul 20mg, Organic Chromium 100mg.

6.Herbal plasters patches

Plaster Patches are Self Adhesive, Warm, a soft, flexible, Pain Relieving Plaster/Patch. Once applied, its ingredients are absorbed into the skin to stimulate blood circulation. It’s quick permeating and warm action provides speedy Temporary Pain Relief and comfort for hours. Plasters are specially used by those who suffer from chronic or prolonged Sore Muscles, Arthritis Pain, Painful Joints, Sprains, Backache, Bruises, Shoulder Pain, Arthraiga, Rheumatic Pain, Neuralgia, and Fracture Pain.There are main two type of plaster patches are Cool plaster patch and Mild hot plaster patch Cool plaster patch provides Rapid, Soothing Pain Relief and Alleviates swelling, with a Cool Refreshing Feeling owing to its “Cool pack effect". Mild Hot plaster patch provides a Rapid, Soothing Relief of Pain, especially caused by chronic diseases. By Deep Heating and improving the capillary Blood Circulation and Metabolism of the effected area owing to its "Hot pack effect". Both Cool and Mild hot works while exerting potent Anti - Inflammatory and Analgesic Effects through the Transdermal Absorption of Active Ingredients. Patches hold a High Moisture Contents in a water-soluble Polymer Base, which enables the Deep Penetration of active ingredients in to the affected area, and provides Sustained Effects through the Continuous Release of its moisture. Plaster Patches design with its "Special Net - Shaped Gel Base", Has an Excellent Affinity to the skin. It may be removed cleanly and easily, even from hairy skin surfaces, Without Pain. Due to its Transdermal Therapeutic System, Plaster Patches can be used safely by the elderly and feeble.

Herbal Plasters Size 4" x 5.5" includes natural herbs like: Powdered Philodendron Bark, Capsicum Extract, Zanthoxylum Fruit, Gardenia Fruit Methyl Salicylate.

METHOD OF APPLICATION OF PATCHES :

Carefully apply the patch to the skin, ensuring it is not cut or damaged, as this could result in an excessive dose of medication. Select a clean, dry area on the body above the waist, such as the front or back. Transdermal patches may be applied to various body areas with clean, dry, and hairless skin, including the back, shoulders, wrists, elbows, upper arms, abdomen, behind the knees, or the arches of the feet.

In individuals such as children or those who may struggle to remove the patch, the upper back is an appropriate location. Avoid applying the patch to skin that is oily, broken, burned, cut, or irritated. Cleanse the area with water only, as soap or alcohol may enhance the absorption of the medication. If the skin is hairy, trim the hair with scissors; shaving is not recommended.

Carefully open the patch packaging and remove the protective strip from the sticky side. Avoid direct contact with the adhesive surface. Press the patch firmly onto the skin using the palm of the hand and maintain pressure for 30 seconds. Immediately wash hands after handling the patch. Prior to applying a new patch, remove the old one, and place the new patch on a different area of the skin. In the event that the patch detaches or causes irritation, remove it and apply a new patch to an alternate site. Dispose of used patches by folding them adhesive sides together and flushing them down the toilet. Replace the patch every three days or as directed by a healthcare provider.

Adhere strictly to the instructions provided on the prescription label, and refrain from exceeding the recommended dosage. Consult a pediatrician prior to administering this medication to children. While the patch may be prescribed for children as young as 2 years old for specific conditions, precautionary measures are required. If the patch replacement is missed, remove the old patch and apply a new one as soon as possible. However, do not apply an additional patch unless explicitly instructed by a healthcare provider.

Conclusion :

Plant products serves as an alternative to synthetic because of its local accessibility, eco friendly nature and lower prices compared to the synthetic products. It has been proved that herbal drugs or drugs from natural origin can be utilized in better form with enhanced efficacy by incorporating them through transdermal route.

There are various herbal patches available to lose weight ,quit smoking relieve stress, increase sexuality, as insect repellant, male energizer, to postpone menopause ,which proves the potential of these natural formulations. Thus herbal transdermal patches can create wonders in the field of healthcare and is an upcoming area which should be explored further

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