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Review Paper

A Review on Transdermal Patches for Wound Healing

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ABSTRACT

Transdermal patches are being investigated for use not only in the systemic delivery of drug but also as a platform of local care for wound healing and the use of transdermal patches is the concept of delivery drug in slow manner comparable to a barrier effect of a transdermal patch in order facilitate advantages over creams, ointments, and bandages which include slow releasing of drug. Preventing form infection, easy to apply and also prevent form systemic reaction. Recent development in the area of polymer technology and in transdermal patches exam loaded patches of anti-microbial, growth factors, nanoparticles for the further use of transdermal patches used in the treatment of wound care.The review aims to describe the concepts, terminology, methods, limitation and future need related to the use of transdermal patches..

INTRODUCTION

Wound healing is the complex process that take place when chain reaction of various cell and molecular occur these mechanisms happen in the process of recovering the tissue. A properly conducted healing process is important in maintaining skin homeostasis and protecting form infection.

Generally, acute injuries do not consume much time for recovery, although chronic injuries like diabetic, foot ulcers and venous leg ulcers have poor rate of healing and occur in clinical and financial challenges for healthcare institution around the world. The conventional way of treating a wound involve the usage of ointments, creams and dressing which have poor drug release, high cost of treatment, reapplication and lack of compliance throughout the wound healing process. Recently patches have been identified as possible carriers for drug delivery in case of wound care. Due to releasing the drug in controlled manner and directly at the site of wound area. However, it is possible with these drug delivery system to create an perfect healing environment and preventing toxicity.

Transdermal drug delivery system

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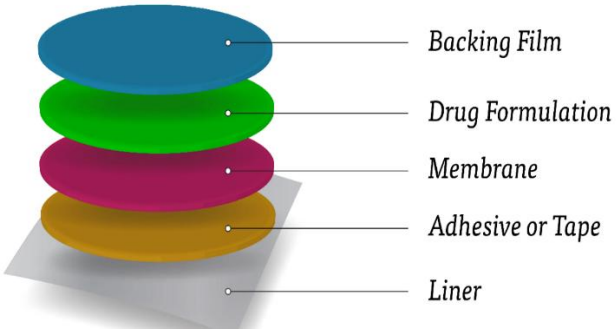
Transdermal drug delivery systems, also known as TDDS, act as a promising alternative to the traditional routes of drug administration like oral and parenteral routes for the transdermal delivery of therapeutic drugs to produce a systemic effect. TDDS has several advantages. These advantages include the fact that it is self-administrable, does not suffer from first-pass effect, requires low doses of the drug, results in fewer side effects, provides an optimal drug schedule, allows the drug to be withdrawn at any time, provides protection against gastrointestinal irritation, and is easily conformable. The application of TDS has been restricted to transdermal patches in the past. These patches are of different types, such as matrix patches, reservoir patches, micro reservoir patches, and adhesive-controlled patches. Nowadays, recent technological innovations are witnessing an improvement in the use of TDS. These innovations include nanovesicles, polymeric nanocarriers, adhesive-controlled nanocarriers, and nano emulsions for passive transdermal drug delivery. Presently, patches are being used as transdermal drug delivery patches for small molecules of drugs. These patches are being used for the transdermal delivery of smaller molecules of drugs. Present-day patches are being used for the transdermal delivery of molecules of different molecular weights, ranging from low molecular weight compounds to larger macromolecules like proteins. these, patches made of microneedles are being used for the transdermal delivery of macromolecule-based biomolecules such as extracted proteins and complete viral particles.

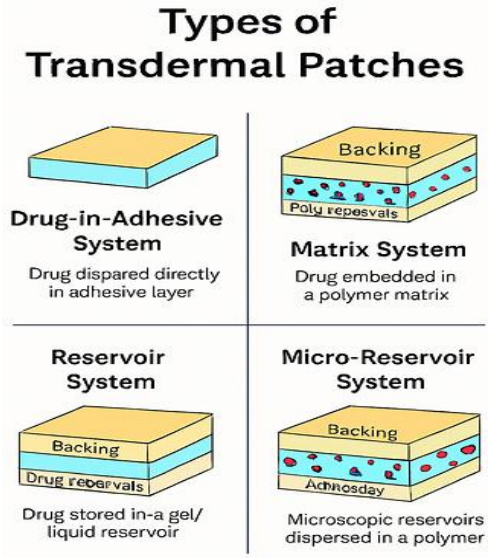


Transdermal patch

Type of transdermal patch in wound healing

Transdermal patches come in different designs and the design of the patch is meant to satisfy different needs for the administration of the drugs. The flexible rate of delivery, rate of absorption, and modes of delivery are meant to satisfy different needs for the drugs.

The following is an overview of different types of transdermal patches.



Transdermal patches are divided into four types are

- Drug in adhesive system
- Matrix system
- Reservoir system
- Micro reservoir system

The most useful patches are used in transdermal drug delivery are reservoir or matrix system

1. Drug in adhesive system

The drug in-adhesive patches, a drug is uniformly dispersed in the adhesive patch that comes in direct contact with the skin surface. Drug in-adhesive patches are used in wound healing because of their simple design and their flexibility in maintaining sustained contact with the wound surface. These patches are safe for carrying antimicrobial agents, anti-inflammatory mediators, or growth factors in wound healing.

2. Matrix system

The matrix-type patch consists of a polymeric matrix in which the drug is distributed. Diffusion from the matrix to the wound site serves as the mode of release of the drug. These patches are used in wound healing because they provide sustained drug release, maintain a moist environment and protect the wound from external contamination. Chitosan, polyvinyl alcohol, and polyurethane are the commonly used polymers.

3. Reservoir system

Reservoir-type patches contain the drug in a liquid or gel reservoir, which is placed between the backing membrane and the rate-controlling membrane. These patches ensure controlled release of the drug, which is beneficial if the wound healing.

4. Micro reservoir system

This formulation has a reservoir and matrix type of dispersion. The drug is prepared by suspending solids of the drug in a solution of a water-soluble liquid polymer in aqueous solution and uniformly dispersing the solution throughout a lipophilic polymer to create thousands of microscopic drug

Method of transdermal patches

Method used for transdermal patches are

1. Asymmetric TPX membrane method:

The backing layer of the prototype patch is a 1cm concave piece of polyester, which can withstand heat sealing. A sample of the drug is placed into the concave membrane, which is then sealed using an adhesive to secure it to the asymmetric membrane. The asymmetric TPX membranes are prepared by the dry or wet method. The preparation of a polymer solution requires TPX

resin in a mixed solvent and non-solvent materials at a 60°C

2. Circular Teflon mould method

Organic solvent solutions are employed with varied concentrations of polymer solutions. The calculated amount of the drug is dissolved in half the organic solvent. Finally, enhancers with different concentrations are dissolved in the remaining organic solvent. A plasticizer is incorporated into the solution with the drug and the polymer. Stirring needs to be done for 12 hours before pouring the mixture into the cylindrical Teflon mould. The moulds are placed on a levelled surface and topped with the inverted funnel to facilitate the solvent vaporization in the laminar flow with the speed of the air at 0.5m/s for the solvent evaporation for a total of 24 hours9.

3. Mercury substrate method

The drug is also dissolved in a solution of polymers and plasticizer. The solution was stirred for 10-15 minutes as described earlier and poured over the levelled surface of the liquid mercury. There was an inverted funnel on top that regulates the rate of evaporation of the solvent.

Components of transdermal patches

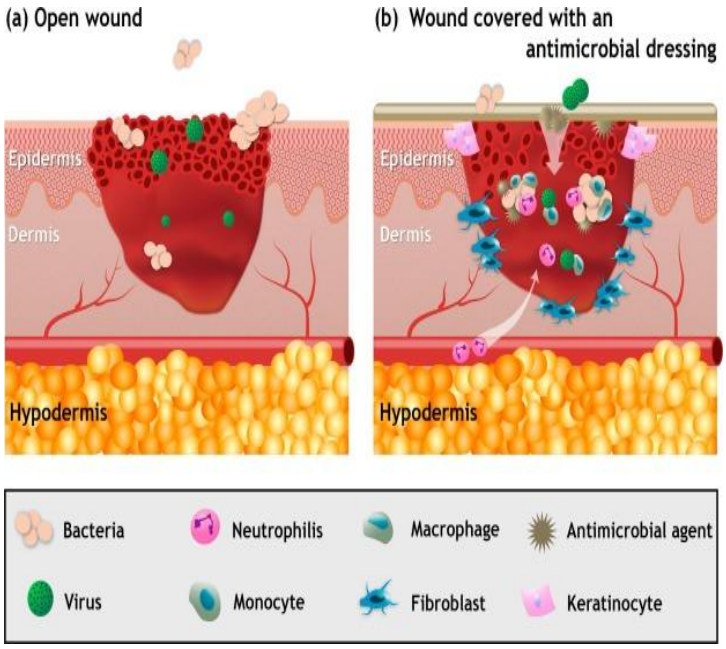
Components	Example	Use
Drug	Choice of Drug	It Is Used For Active Therapeutic Agent
Becking Laminates	Ex: vinyl, polyester films and Polypropylene resin	the outermost surface of patch which protects the formulation
Pressure Sensitive Adhesive	Ex: acrylics, silicon and polyisobutylens	Adhesion of patch to skin
Permeation Enhancer	Ex: saponins, fatty acid and salicylic acid	Promote skin permeability
Other Recipients	Ex: plasticizers	Provide plasticity to the transdermal patches

Active agent used for wound healing

The transdermal patches for the treatment and healing of wounds contain a host of active ingredients such as growth factors, antimicrobial agents, anti-inflammatory agents, antioxidants, and analgesic agents, among others, that aid significantly in enhancing the process of wound healing and preventing infections by controlling microbial growth, as well as reducing the risk of inflammation and pain by limiting the amount of fluid accumulated on the injured part of the body thus making it suitable for the treatment and healing process as it reduces the possibility and the risk of re-infection and complications such as inflammation, pain, and the growth of fluid on the region where the healing has already taken place with the aid of the transdermal patches

Growth factors such as platelet-derived growth factor, epidermal growth factor, and vascular endothelial growth factor act as key agents in the process, as they aid in the proliferation, development, and synthesis of collagen, hence accelerating the process and promoting the faster closure and healing of the tissue with the aid of the transdermal patches.

Anti-inflammatory agents such as non-steroidal anti-inflammatory and corticosteroids, on the contrary, aid significantly in reducing fluid, inflammation, and pain



Challenges and limitation

Although there are a few challenges and limitations in using these patches in a broad clinical setting. The first challenge or limitation lies in the skin barrier, in which stratum corneum hinders the diffusion of a few drugs, particularly large molecules like proteins, peptides, and growth factors. It is easy to ensure that a constant concentration level of a drug in a wound site because of variations in skin permeability and exudate quantity as well as local physiological conditions. Excess moisture in chronic wounds would possibly affect either the affinities or result in poor controlled release delivery systems of patches. Irritation, allergy and contact dermatitis caused by polymers and active pharmaceutical agents would possibly be a source of concern from safety issues however, these could be reduced by their long-term usage. In addition, a uniform release system obviously poses a question that might be changed by patch thickness, polymer properties, or environment conditions. The stability properties of biomaterials would obviously be a concern in cases of active pharmaceutical agents placed in transdermal patches because these are possibly highly temperature, moisture and light-sensitive. Transdermal patches are not suitable for large or highly infection wound in this case advanced wound dressing is need.

FUTURE SCOPE

The biomaterial and drug delivery technologies are continuously improving, hence making the future of transdermal patches for wound healing quite bright. Being capable of responding to the conditions of the wound, such as pH, temperature, or infection, new smart transdermal patches are being developed that are capable of controlled and personalized drug release. Further, drug penetration will be enhanced by the use of nanotechnology together with microneedle-assisted systems, hence improving the delivery of the macromolecules like growth factors and peptides. Moreover, biodegradable and bioactive polymers are of great importance in the development of multifunctional patches due to their antimicrobial and regenerative properties, which support tissue repair while delivering therapeutic agents. Integration of sensing technologies for real-time wound monitoring may

further improve the treatment outcome, at least for chronic and diabetic wounds.

CONCLUSION

The promising technology for the treatment and recovery of wounds is the transdermal patch, as the technology has proven the ability to distribute medicine with control in the respective area, ensuring a good environment surrounding the area with the wound, hence the increase in its applicability and benefits by promoting a good environment for its use.

The transdermal patch has a bright future for the treatment of non-healing wounds because it increases the rate of compliance by the patient and also protects the patient from infections by ensuring fast regeneration of tissue

REFERENCES

1. Singer, A. J., & Clark, R. A. (1999). Cutaneous wound healing. New England Journal of Medicine, 341(10), 738–746. https://doi.org/10.1056/NEJM199909023411006
2. Kumar, V., Abbas, A. K., & Aster, J. C. (2023). Transdermal drug delivery systems. In Advanced drug delivery systems (pp. 333–362). Springer Nature.
3. Prausnitz, M. R., & Langer, R. (2008). Transdermal drug delivery. Nature Biotechnology, 26(11), 1261–1268. https://doi.org/10.1038/nbt.1504
4. Boateng, J. S., Matthews, K. H., Stevens, H. N., & Eccleston, G. M. (2008). Wound healing dressings and drug delivery systems: A review. Journal of Pharmaceutical Sciences, 97(8), 2892–2923. https://doi.org/10.1002/jps.21210
5. Guy, R. H., & Hadgraft, J. (2003). Transdermal drug delivery systems. Marcel Dekker.
6. Chien, Y. W. (1992). Novel drug delivery systems (2nd ed.). Marcel Dekker.
7. Patel, D., & Chaudhary, S. (Year not available). Transdermal drug delivery system. Pharmaceutical Reviews.
8. Boateng, J. S., Matthews, K. H., Stevens, H. N., & Eccleston, G. M. (2008). Wound healing dressings and drug delivery systems: A review. Journal of Pharmaceutical Sciences, 97(8), 2892–2923.
9. Barrientos, S., Stojadinovic, O., Golinko, M. S., Brem, H., & Tomic-Canic, M. (2008). Growth factors and cytokines in wound healing. Wound Repair and Regeneration, 16(5), 585–601. https://doi.org/10.1111/j.1524-475X.2008.00410.x
10. Guo, S., & DiPietro, L. A. (2010). Factors affecting wound healing. Journal of Dental Research, 89(3), 219–229. https://doi.org/10.1177/0022034509359125
11. Donnelly, R. F., Singh, T. R. R., & Woolfson, A. D. (2010). Microneedle-based drug delivery systems: Microfabrication, drug delivery, and safety. Advanced Drug Delivery Reviews, 62(3), 1–15.
12. Singh, S., Young, A., & McNaught, C. E. (2017). The physiology of wound healing. Surgery (Oxford), 35(9), 473–477.

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