

Nano-based of the  
human body covering  
almost 2m<sup>2</sup>



**ASSIGN  
BUSTER**

## Nano-based transdermal and intravenous drug delivery

systems Introduction Skin is the readily accessible largest organ of the human body covering almost 2m<sup>2</sup> and each cm<sup>2</sup> contain approx 10-70 hair follicles and 180-250 sweat ducts. In recent times, transdermal drug delivery system (TDDS) has gained much interest as noninvasive technique emerged in the medical science. With the advent of nano-synthesis of drug molecules or formulations, TDDS got much need boost majorly due to improved patient compliance and increased efficacy.

In TDDS, drug in a self contained discrete form known as patch (2, 3), are applied to skin and drug is delivered in controlled manner to systemic circulation through the skin 4 5. TDDS is designed in such away that it delivers drug at preset rate without inter and intra patient variation. 3 Currently transdermal delivery is one of the most promising methods for drug application. 6 TDDS has many advantages like improved patient compliance, less side effects, and lesser drug overdosing etc. however, it is still challenging because skin is a protecting barrier to water as well as to endogenous or exogenous materials (drugs/chemicals) owing to its multilayered structure. The outer layer of the skin acts as a shield; as it is comprised of corneocytes interspersed in lipid rich complex which is the primary factor for its barrier like property. To overcome the barrier, many new improved techniques have been developed to enhance the drug bioavailability as well as development of new range drugs to be administered transdermal/ topically.

Rationale of TDDS Why and When TDDS is important?? Intravenous drug delivery is invasive and apprehensive in nature though it has advantage

<https://assignbuster.com/nano-based-of-the-human-body-covering-almost-2m2/>

of bypassing first pass metabolism. TDDS offers many advantages over other delivery systems e. g.

1) Skin is the largest readily accessible organ (1 to 2 m<sup>2</sup>) for absorption and its non invasive and patient compliant. 2) TDDS can release drugs (having short half life and narrow therapeutic indices) more systemically in to system. TDDS is not meant for achieving rapid bolus drug inputs or for the drugs having high oral bioavailability and infrequent dosing regimen rather, TDDS is designed with the aim to give slow, sustained delivery of the drug over a period of time. Drugs which cause tolerance development in patients and drugs requiring chronopharmacological management are least candidates of TDDS.

The likely candidate of TDDS must be highly potent i. e. requiring therapeutic blood concentrations in the ng/ ml range or less. Owing to selective diffusion of SC, not all types of the drugs can cross this barrier and daily drug dose is limited to 10 mg only systemically by a patch. Transdermal drug delivery systems possess numerous advantages and disadvantages as given in table 1.

Advantages	Disadvantages
Self-administration of drug in controlled /continuous manner is possible, in case of adverse effect drug administration can be stopped by removal of patch	removal Large dose administration ( i. e. more than 10 mg/ day) is problematical
Delivery of drug is not affected by food and gastrointestinal (vomiting or diarrhea) problems	Not suitable for drugs having size more than 500 Dalton
First pass metabolism in the liver does not take place, hence lower doses of drug given, leading to lesser	

chances of side effects. High plasma drug concentration is difficult to achieve Hepatic induction likelihood lessens. High drug dose may cause allergies/irritation It can be administered to patient having facial injuries. Ionic drugs not easy to administer and drugs having low or high partition coefficient do not reach systemic circulation It requires less frequent dosing regimen and non invasive and patient complaint. Skin permeability variation within same person (from one site to another), from person to person and with age Easy to prepare and transport Contact between skin and device/patch is problematic since they usually falloff due to wetting effect of sweat or water (during bathing) Drug absorption route through theSkinIn skin, drug permeation takes place by diffusionthrough different layers of skin as well as through hair follicles and sweatglands and the intrinsic physicochemical properties of the drugs governs theflux of the molecules through these routes.

As discussed in previous section usually acts as a barrier for effective drug delivery but other routes of systemicabsorption are also present.

Differentpermeation routes are recognized in TDDS (Fig.): a) Intercellular; b)intra/transcellular; c) transappendegeal route.