TRANSDERMAL DRUG DELIVERY SYSTEM (TDDS)

Introduction, advantages & disadvantages .
Skin : site of drug delivery.
Skin Anatomy , transport mechanisms.

Transdermal drug delivery offers an attractive alternative to the oral administration and injection. Today about **74% of drugs are taken orally and** are found not to be as effective as desired.

Drug delivery through the skin (for systemic effect) is commonly known as TDD and differs from traditional topical drug delivery.

also known popularly as 'patches'.

Transdermal patches: are dosage forms designed to deliver a therapeutically effective amount of drug from the outside of the skin through its layers into the blood stream.

Definition:

Transdermal drug delivery is defined as a self contained discrete dosage form, which when applied to the intact skin, will deliver the drug at a controlled rate to the systemic circulation.

OR

Transdermal drug delivery systems (patches) are dosage forms designed to deliver a therapeutically effective amount of drug across a patient's skin also defined as Medicated adhesive patch that is placed on the skin to deliver a specific dose of Medication through the skin and into the blood stream.

Advantages

1. avoids the stomach environment;

2. no GI distress or other physiological contraindications of the oral route exist;

3. easy to use, patches can Increases compliance & Reduce medical costs;

4. avoids the first-pass effect;

5. If a transdermal delivery system is used in place of a needle, then **medical waste can**

also be Reduced , again, Reduced healthcare costs.

6. allows for the effective use of drugs with short biological half-lives;

7. allows for the administration of drugs with narrow therapeutic windows;

8. provides steady plasma levels of highly potent drugs;

9. TDDS, especially simple patches, are easy to use and noninvasive and patients like noninvasive therapies.

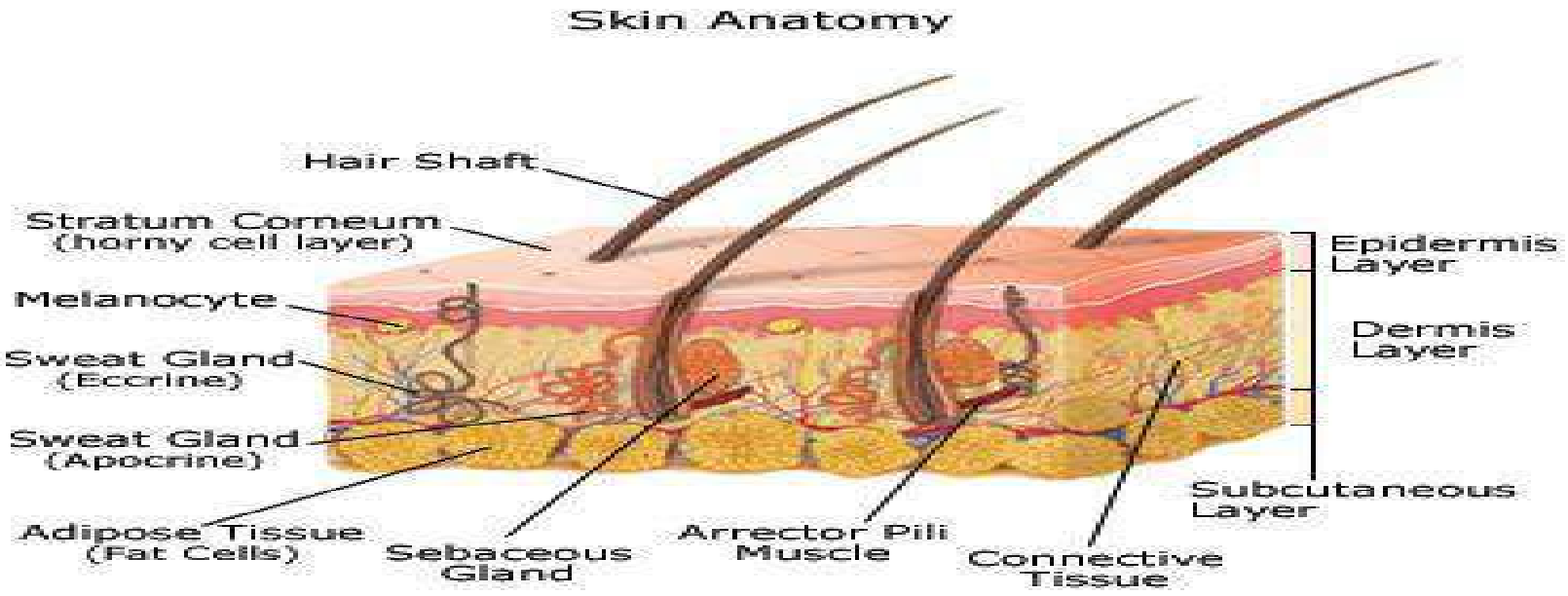
Disadvantages

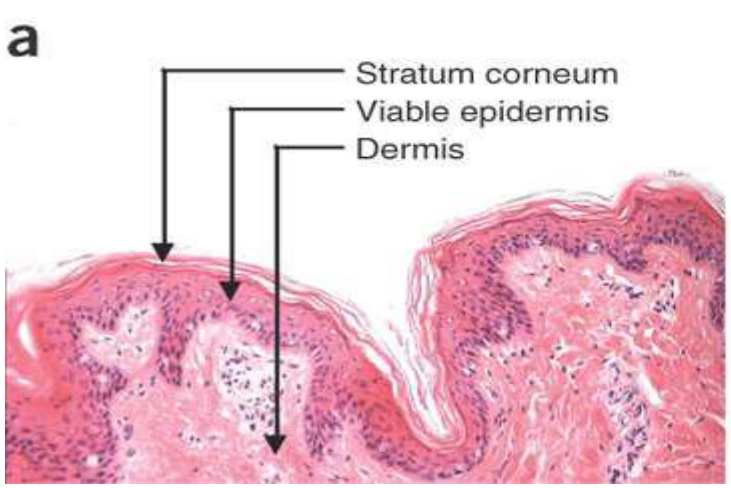
1. drugs that require **high blood levels cannot be administered;**
2. The **adhesive used may not adhere well to all** types of skin;
3. drug or drug formulation may cause **skin irritation or sensitization;**
4. the patches can be **uncomfortable to wear;**
5. and this system **may not be economical for** some patients.

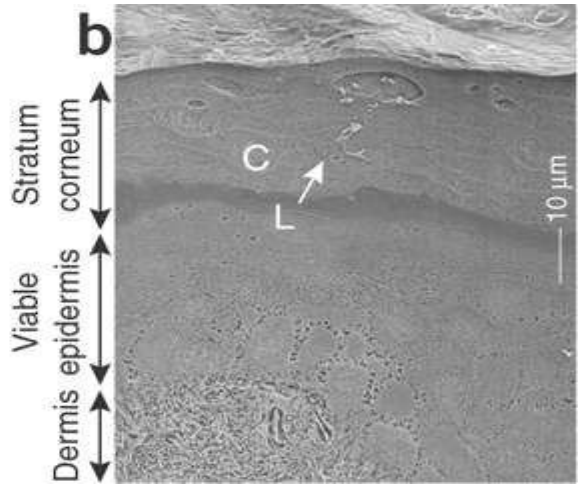
Skin : site of drug delivery.

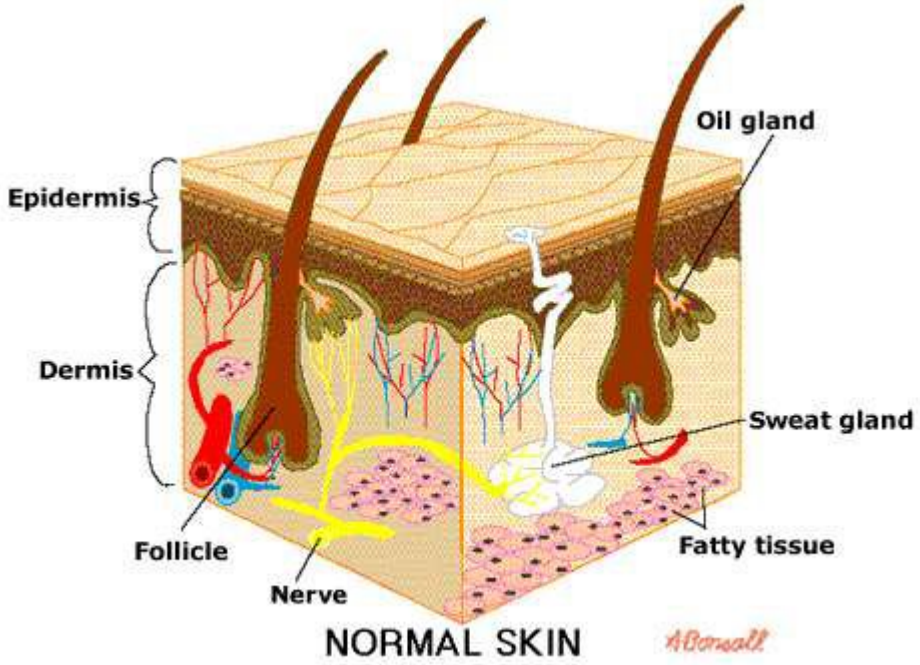
STRUCTURE OF SKIN

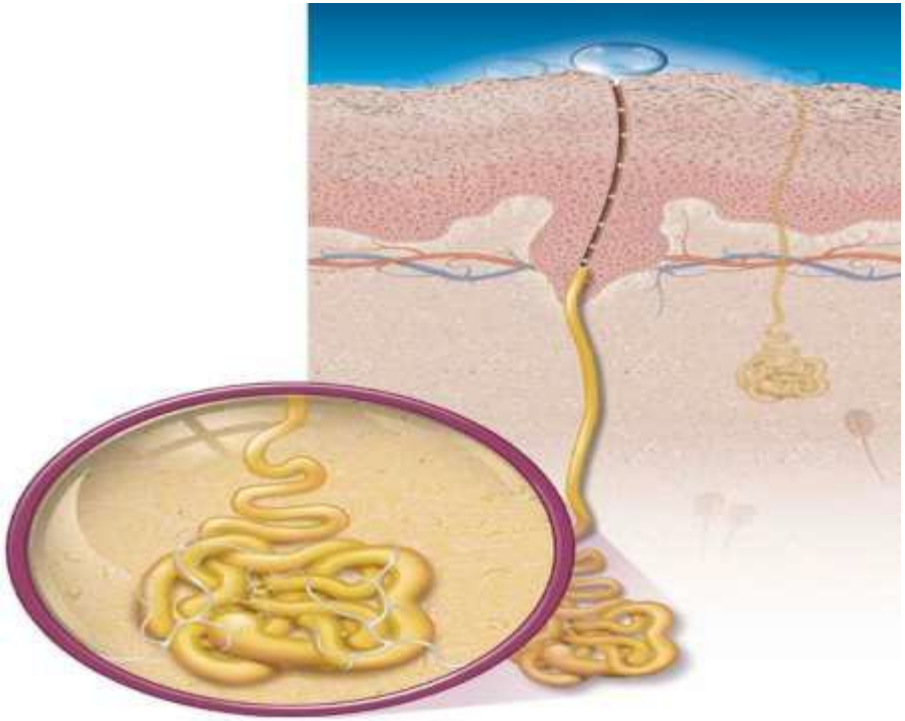
- **Epidermis:**
  - Stratum corneum (Horny cell layer)
  - Stratum lucidum (Clear layer)
  - Stratum granulosum (Granular Layer)
  - Stratum spinosum (Prickly layer)
  - Stratum germinativum
- **Dermis:**
- **Hypodermis or Subcutaneous layer:**











Hairy skin develops hair follicles and sebaceous glands

Epidermis

It is the outermost layer of the skin, which is approximately 150 micrometers thick. Cell from lowers layers of the skin travel upward during their life cycle and become flat dead cell of the corneum. The source of energy for lower portions of epidermis is also glucose, and the end product of metabolism, lactic acid accumulates in skin.

Stratum Germinativum- Basal cells are nucleated, columnar. Cells of this layer have high mitotic index and constantly renew the epidermis andthis proliferation in healthy skin balances the loss of dead horny cells from the skin surface.

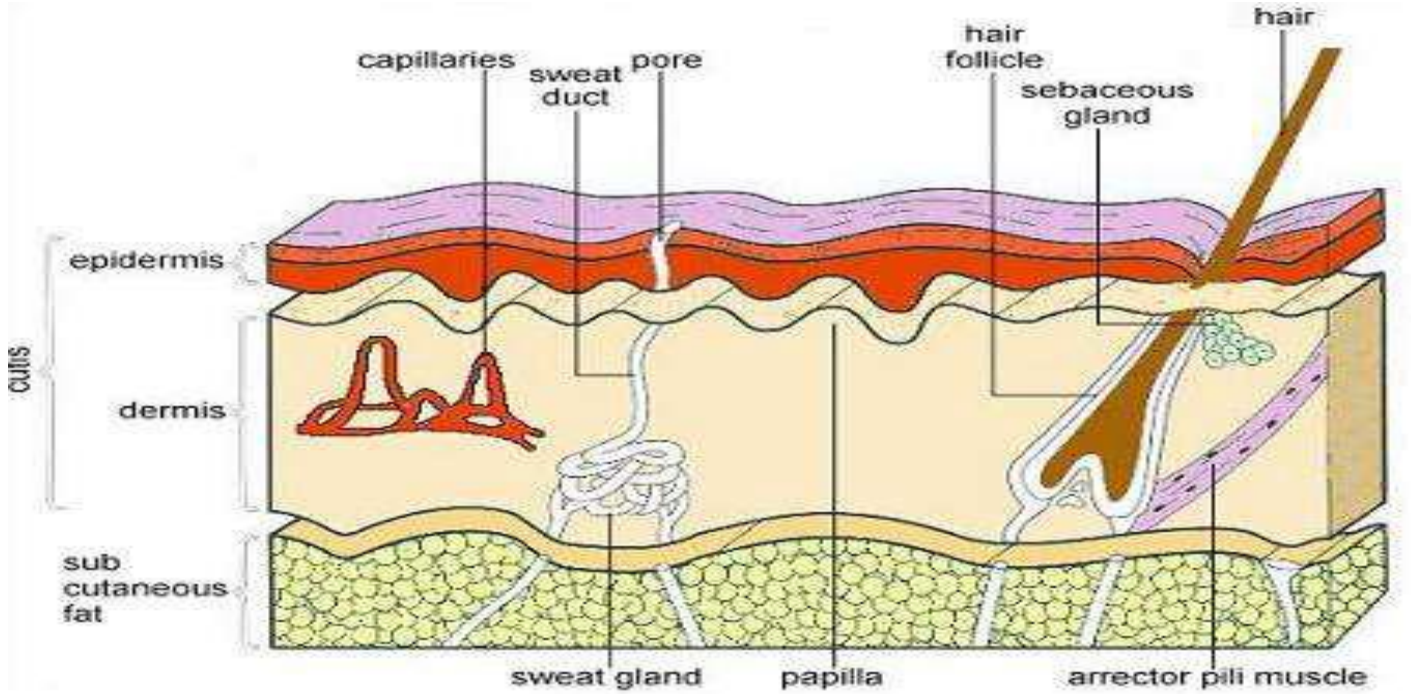
Malpighion Layer- The basal cell also include melanocytes which produce the distribute melanin granules to the keratinocytes required for pigmentation a protective measure against radiation.

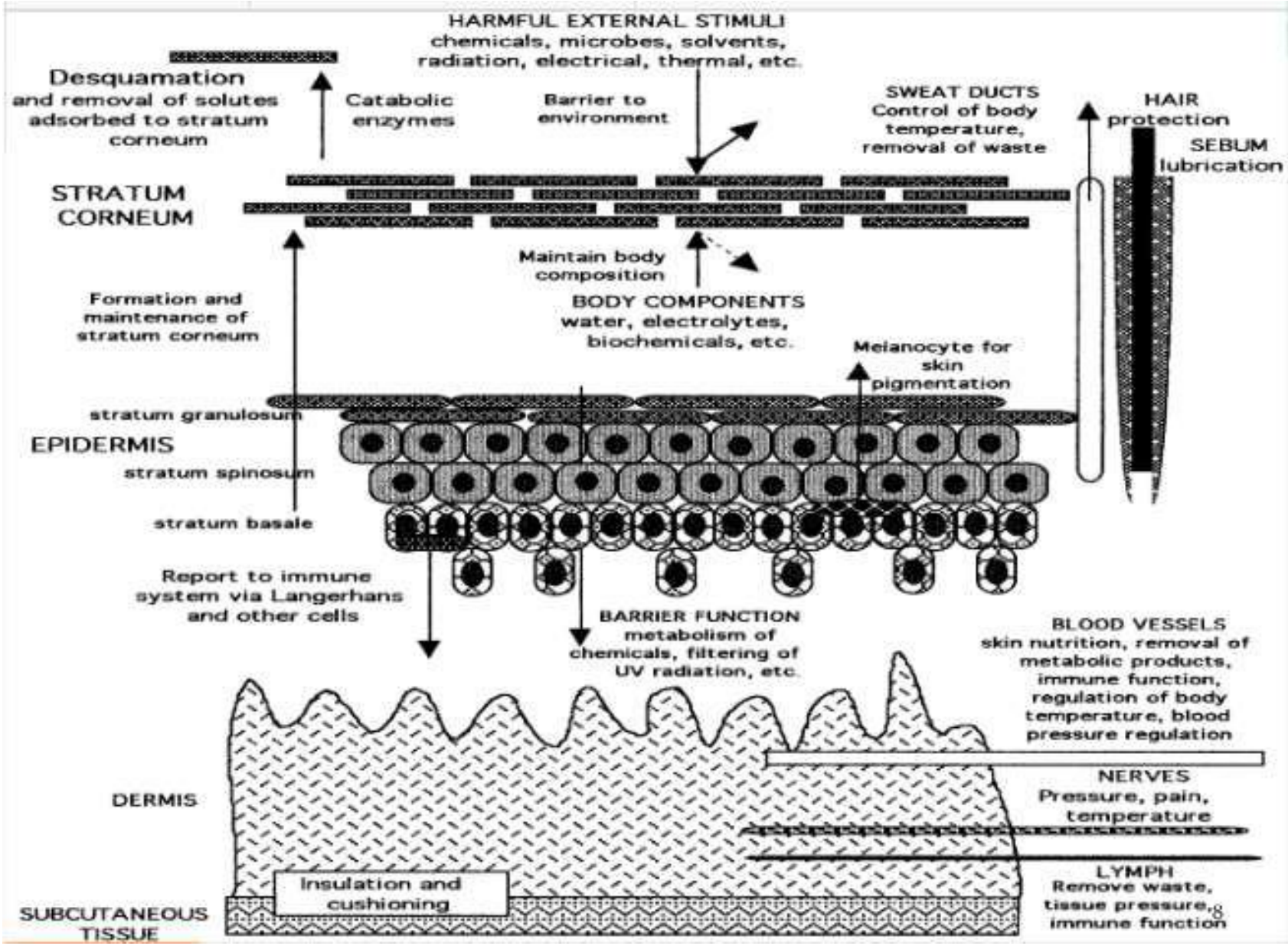
Stratum Spinosum- The cell of this layer is produced by morphological and histochemical alteration of the cells basal layers as they moved upward. The cells flatten and their nuclei shrink. They are interconnected by fine prickles and form intercellular bridge the desmosomes. These links maintain the integrity of the epidermis.

Stratum Granulosum- This layer is above the keratinocytes. They manufacturing basic staining particle, the keratinohylline granules. This keratogenous or transitional zone is a region of intense biochemical activity and morphological change.

•**Stratum Lucidum-** In the palm of the hand and sole of the foot, and zone forms a thin, translucent layer immediately above the granule layer. The cells are non-nuclear.

•**Stratum corneum-** At the final stage of differentiation, epidermal cell construct the most superficial layer of epidermis, stratum corneum. At friction surface of the body like palms and soles adapt for weight bearing and membranous stratum corneum over the remainder of the body is flexible but impermeable. The horny pads (sole and palm) are at least 40 times thicker than the membranous horny layer




HARMFUL EXTERNAL STIMULI
chemicals, microbes, solvents, radiation, electrical, thermal, etc.
Desquamation
and removal of solutes adsorbed to stratum corneum
Catabolic enzymes
Barrier to environment
SWEAT DUCTS
Control of body temperature, removal of waste
HAIR
protection
SEBUM
lubrication
STRATUM CORNEUM
Maintain body composition
Formation and maintenance of stratum corneum
BODY COMPONENTS
water, electrolytes, biochemicals, etc.
Melanocyte for skin pigmentation
stratum granulosum
EPIDERMIS
stratum spinosum
stratum basale
Report to immune system via Langerhans and other cells
BARRIER FUNCTION
metabolism of chemicals, filtering of UV radiation, etc.
BLOOD VESSELS
skin nutrition, removal of metabolic products, immune function, regulation of body temperature, blood pressure regulation
NERVES
Pressure, pain, temperature
DERMIS
LYMPH
Remove waste, tissue pressure, immune function
Insulation and cushioning
SUBCUTANEOUS TISSUE

Dermis

Non-descriptive region lying in between the epidermis and the subcutaneous fatty region. It consist mainly of the dense network of structural protein fibre i.e. collagen, reticulum and elastin, embedded in the semigel matrix of mucopolysaccaridic 'ground substance'. The elasticity of skin is due to the network or gel structure of the cell. Beneath the dermis the fibrous tissue open outs and merges with the fat containing subcutaneous tissue. *Upper formed* into ridges or papillae protecting into the epidermis, which contain blood vessel, lymphatic and nerve endings. Protein synthesis is a key factor in dermal metabolism.

Subcutaneous tissue

This layer consist of sheet of fat rich areolar tissue, know as superficial fascia, attaching the dermis to the underlying structure. Large arteries and vein are present only in the superficial region.

Skin Appendages

The skin is interspersed with hair follicle and associated sebaceous gland like regions two types of sweat glands eccrine and apocrine. Collectively these are referred to as skin appendages.