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2nd Edition

Diagnosis and Management of DERMATOLOGIC DISORDERS Made Easy®

(Including STDs, Leprosy, HIV and AIDS)

SK Punshi



Foreword
SJ Yawalkar

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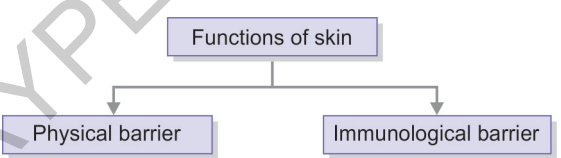
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Physiology of Skin

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The skin perfoms a multitude of functions. These are:

(1) *Protective function:* As an organ of protection, the skin exhibits a wide range of modifications in the various species of animals. In human beings, the tough, horny, and keratinized waterproof epidermis, and appendages like hair and nails, provide sufficient strong barrier against injury.



(2) *Sense organ:* The skin is richly supplied with nerves and various types of specialized sensory end-organs, which provide information regarding environmental changes.

(3) *Secretion and excretion:* The skin possesses various types of glands which pour secretions on the surface. Sweat in its composition consist of 1.2% solids (organic 0.4% and inorganic 0.8%) and 98.8% water. The important substances

excreted in it are: sodium chloride, sodium phosphate, sodium bicarbonate, keratin and a small amount of urea. Man perspires very little at low and moderate temperature, but his perspiration sharply increases at high temperature. The *sebaceous glands* of the skin secrete *sebum* which is composed of fatty acids, cholesterol, alcohols, etc. Excessive production of sebum is called seborrhea. Sebaceous glands undergo marked hypertrophy during puberty indicating hormonal control of these glands.

(4) *Body heat regulation:* The vital activity of warm blooded species like human beings is, in a large measure, independent of the temperature conditions of the external environments because of their constant internal temperature. *The skin plays the most important role in the regulation of heat loss*. It loses heat to the external environment in three ways: *by conduction,* by *radiation*. The heat loss through the skin is regulated by various physiological mechanisms which include (1) the reaction of the cutaneous vessels, (2) perspiration, and (3) the reaction of the smooth muscle fibers of the skin. *Hair also plays a major part in limiting the heat loss in animals*. Contraction of the arrector pili occurs at low temperatures.

(5) *Storage function of skin:* The dermis in conjunction with the hypodermis has a considerable capacity for string various materials, of these the best known are fat and blood.

(a) Fat is laid down in fat cells as a permanent store of subcutaneous adipose tissue. This provides the reserve stores of body energy. Incidentally, it also prevents heat loss, and is good shock absorber.

(b) Blood is stored in the rich subpapillary plexuses of the dermis. A rough estimate of its capacity in a normal adult comes to near about one liter. Whenever there is a greater requirement of blood by the muscles or other organs, blood is directed from this storehouse to those regions.

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(c) The skin is also a good storehouse of ergosterol—the provitamin for vitamin D. This ergosterol is irradiated by the ultraviolet light of the sun and converted into vitamin D (calciferol).

(d) The other type of storage which occurs in the skin is what has been called by Cannon as *storage by inundation*. This, in fact, is the storage of extracellular fluid in the interstitial spaces.

(6) *Absorption:* It is almost an established fact that the uninjured skin is impermeable to watery solution of salts or other substances. Jons can, however, be made to permeate with the application of an electric current by a process known as *iontophoresis*.

(7) *Gaseous exchange through skin:* A small amount of gaseous exchange occurs through the skin. In man the amount of CO_2 exchanged through the skin is negligible compared to the amount exhaled from the lungs (near about 1/150–1/200 of that exhaled by the lungs). But in a thin skinned animal like the frog, the absorption of O_2 and the excretion of CO_2 through the skin may be sufficient for the proper oxygenation of its blood, so that it may continue to live even after the removal of its lungs.

IMMUNOLOGICAL FUNCTION OF SKIN

The skin immune system (SIS) is best considered as a functionally independent unit with components derived from the epidermis, dermis, blood vessels and lymphatics and acts as a immunological protective system or barrier.

EMBRYOLOGY OF SKIN

The whole of the skin, epidermis and dermis, is a unified integrated organ system, but it develops from two different primitive embryonic layers epidermis from the *ectoderm* and dermis from the *mesoderm*.

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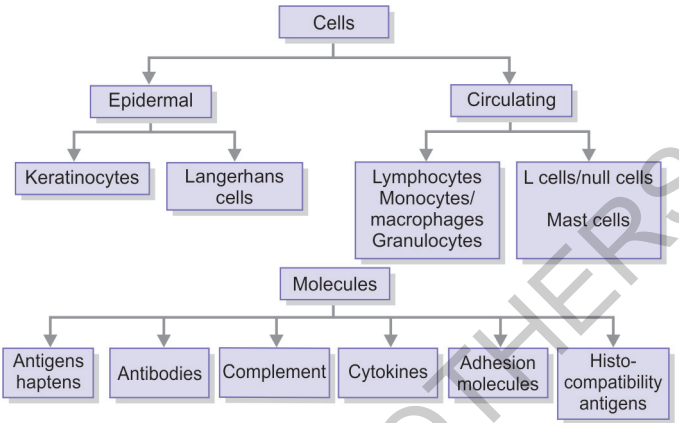


Fig. 3.1: Components of the skin immune system

SUMMARY

To summerise the functions of the skin

1. Barrier to the loss of water, electrolytes and macro molecules.
2. Regulation of body temperature.
3. Skin is sense organ for touch, temperature, pain and itch.
4. The skin surface has antibacterial and antifunal properties (normal flora and fauna).
5. Acid PH and negative electric charge on skin prevents bacteria, etc.
6. Vitamin D is produced on skin.
7. It is a secretary as well as excretary organ.
8. Skin regulates blood pressure.
9. Reservoir of electrolytes, water, vitamins, fats, carbohydrates, proteins, etc.
10. Immunological barrier.
11. It gives a clue to physician as indicator of internal disease process.

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ALLERGY AND IMMUNOLOGY

Organs of the Immune System

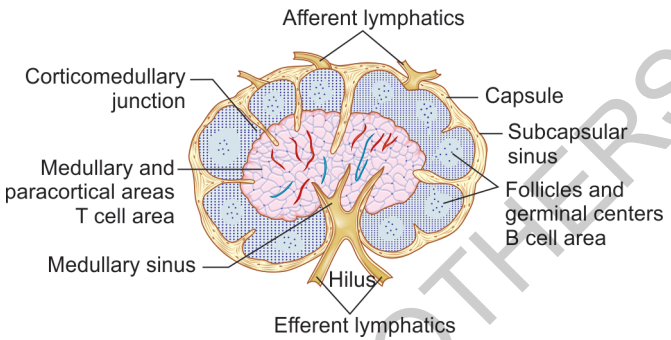


Fig. 3.2: Lymph node structure indicating primary T cell and B cell areas

Immune System Components

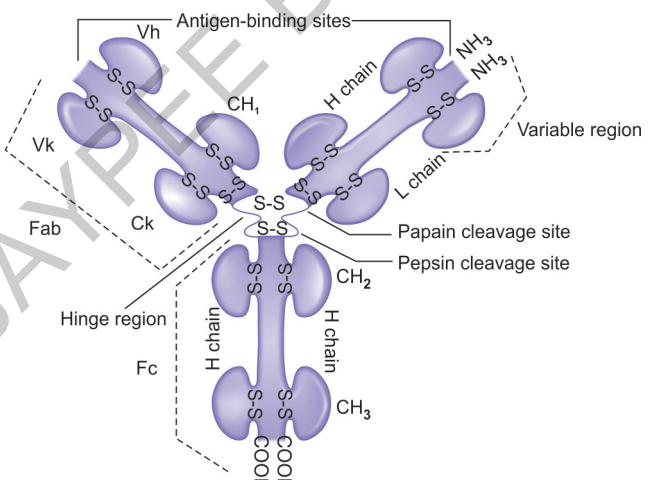


Fig. 3.3: Basic immunoglobulin structure with immunoglobulin subunits produced by enzyme

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Antigen–Antibody Interactions Classification of Immunologic Reactions

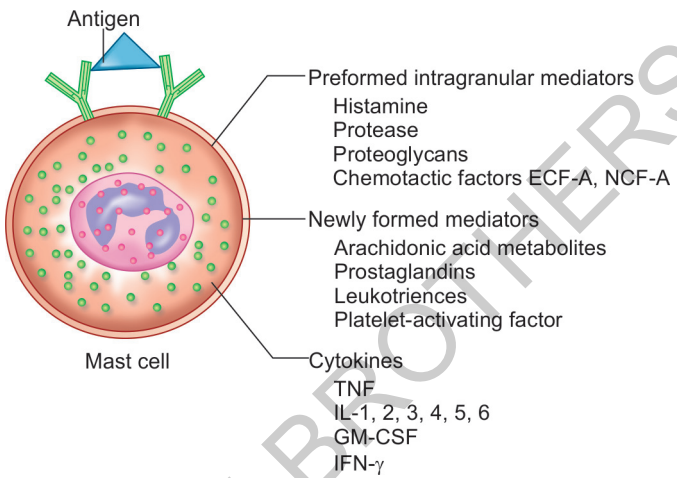


Fig. 3.4: Type 1: Anaphylactic of immediate hypersensitivity

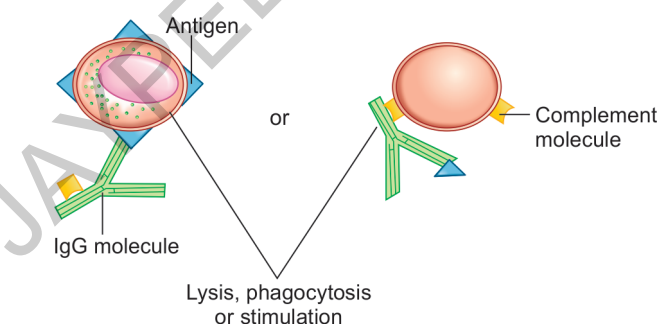


Fig. 3.5: Type 2: Cytotoxic reactions

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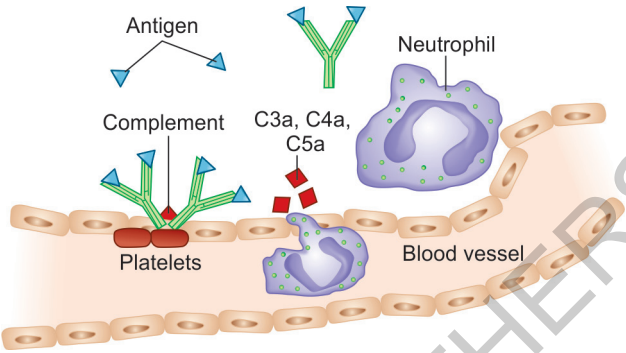


Fig. 3.6: Type 3: Immune complex-mediated reactions

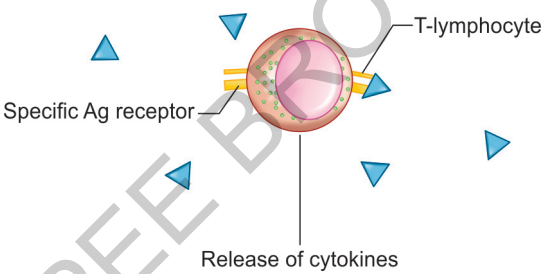


Fig. 3.7: Type 4: Delayed hypersensitivity

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- A concise text on the subject
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SK Punshi is a well-known figure in the field of dermatology. He is an Ex-President of Indian Medical Association, Amravati; Ex-Joint Secretary of Indian Medical Association, Maharashtra; Ex-President of Indian Association of Dermatologist, Venereologists and Leprologists, Maharashtra; Ex-President of Dermatological Society of Vidarbha; and Ex-President of All India Association of Dermatologists and Leprologists. He is also an Ex-Member of the editorial board of the IADVL journal.

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