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CONCEPTUAL REVIEW OF AYURVEDIC TWACHA W.S.R. TO PHYSIOLOGY OF SKIN.

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Abstract: Ayurveda, ancient, yet timeless, gives us the means of attaining and maintaining our own optimal health and well being. Ayurveda has been passed down through the centuries as a complete healing system. In Ayurvedic texts, the skin is extremely compound organ. It is adhithana of "Sparshan Gyanendriya", which is responsible for "Sparshgyana" or "Tactile sensation". Synonyms of skin as per ayurveda are "twacha" and "charma" which are commonly used. Twacha is derived from matruja bhava. it is mrudu (soft) in nature. There are 7 dhatus in the chaturvinshatitattwatmak purush and dhatus contain updhatus. Twacha is updhatus of mamsa. The followers of charaka system of school advocate that skin layers are 6 in number.

According to charaka there are three rogamarga in which Twak and raktadi dhatu are bahya rogamarga. As twacha is upadhatu of mamsa, ultimately it developed from mamsa dhatu. which are basically blood born diseases but all these appear on skin. Twacha is directly related to mamsavaha srotasa as it is the mula of this srotas but also indirectly related to swedvaha srotas because the mula of this srotas are dependent on twaka. The skin is the first line of defense against the environmental agent and mirror of internal pathology. The skin is developed from the surface ectoderm and its underlying mesenchyme (mesodermal cells).

Index Terms – Twacha, Ayurveda Physiology, Skin, Modern Physiology.

I. INTRODUCTION

Ayurveda, ancient, yet timeless, gives us the means of attaining and maintaining our own optimal health and well being. Ayurveda has been passed down through the centuries as a complete healing system. It always deals with the well being status of an individual with respect to physical, mental and spiritual manner. It is not only the materialistic science but a philosophical fact and truth.

Health is most important for happy life. Today people's lifestyle is changing rapidly. People have many ways to live better life than even before. We need help of our golden rules which are proved before millenniums in ayurveda by our great acharyas about every field of life. Ayurveda indicates us about physical, moral, mental, spiritual well being which gives us the knowledge and correct way of a better, healthy and long life. Ayurveda clearly indicates how to maintain our physical, mental as well as spiritual well being.

It describes the basic and applied aspect of life process, health, disease and management in the term of its own principles and approaches. In Ayurvedic texts, the skin is extremely compound organ. It is adhithana of "Sparshan Gyanendriya"⁽¹⁾, which is responsible for "Sparshgyana" or "Tactile sensation". Skin is the largest organ of body. It is in terms of both weight between 6 and 9 pounds and surface area about 2 sq.yd. Skin separate the inside of our body from outside world. It protects us from bacteria and viruses and regulate our body temperature. As skin provide the outer protective covering to combat external factors which are responsible for disturbing the homeostasis of body. Skin being the organ of cosmetic importance has a very strong compact over the psychic of person. The skin is the organ of integumentary system i.e. covering system of the body. It is formed by about 8% of the total body mass. Langerhans Cells, T-Lymphocyte, Mass cell are present in skin layers and pathology of skin is also mentioned in details. According to ayurveda there is always, the base of human body are 3 doshas, 7 dhatus and 3 malas. 7 dhatus constitute the basis of anatomy of body. Human body is covered by twak mainly, which represents the rasa dhatu.

AYURVEDA REVIEW: TWACHA.**Etymology :**

Synonyms of skin as per ayurveda are “twacha” and “charma” which are commonly used.⁽²⁾

Definitions:

The part of the body, which completely covers meda, shonita and other dhatu and gets spreading over, is called twacha.⁽³⁾

Origin Of Skin:

Among the bhavas which are 6 in numbers described by our classics. Twacha is derived from matruja bhava.⁽⁴⁾ it is mrudu⁽⁵⁾ (soft) in nature. There are 7 dhatus in the chaturvinshatitwatmak purush and dhatus contain updhatus. Twacha is updhatus of mamsa.⁽⁶⁾

Susruta described that after the dhatwagnipaka of shukra and shonita, twacha is produced. Skin originates as cream after cooling of boiled milk.⁽⁷⁾ Twacha is formed by paka of raktadhatu by its dhatu agni.⁽⁸⁾

Panchabhautiktva Of Skin:

PRUTHVI- Twacha is parthiva avayava.

JALA- Snigdha and mrudu guna of skin is due to jala mahabhuta.

TEJA- Abha and varna of skin is due to bhrajak pitta which is mainly constituted by tejas mahabhuta.

VAYU- Twacha is sparshanendriya adhisthana which is vatadhisthana.

AKASHA- Swedavahi srotasa (micro channels of sweat glands) are indicative of akasha mahabhuta.

Layers Of Skin:

The followers of charaka system of school advocate that skin layers are 6 in number, while the followers of susruta's system of school advocate that skin layers are 7 in number.

Layers		1.					
CHARAKA	Udaka-dhara	Asrug-dhara	Sidhma, Kilasa Sambhava Adhishthanaa	Dadru, Kushtha Sambhava Adhishthana	Alaji, Vidhradi Sambhava Adishthana	Tamah- Pravesh Dushta arunshika	—
SUSHRUTA	Ava-bhasini (1/18 of vreehi) Sidhma, padmakantka	Lohita (1/16 of Vreehi Tilkalaka Nyach, vynga, adisthana	Sweta (1/12 of Vreehi) Charmadala Ajgallika Masaka adhishthana	Tamra (1/8 of Vreehi) Kilasa, Kushtha Adhishthana	Vedini (1/5 of Vreehi) Kushtha, Visarpa adhishthana	Rohini (1 of Vreehi) Granthi Arbuda Apachi Sleepada Galganda adhishthana	Mamsa- Dhara (2 vreehi) Bhagandara Vidradhi, Arsha, adhishthanas
VRUDDHA VAGBHAT TA	Udaka-dhara	Asruka- dhara	Sidhma, Kilasa adhishthana	Sarva kushtha adhishthana	Alaji, Vidradhi adhishthana	Prana- Dhara Tamah- Pravesh arunshi	-

	Bhasini (1/18 of Vreehi)	Lohita (1/16 of Vreehi)	Sweta (1/12 of Vreehi)	Tamra (1/8 of Vreehi)	Vedini (1/5 of vreehi)	Rohini (1 vreehi)	Mamsadhara (2 vreehi)
SHARANG-DHARA	Ava-bhasini Sindhma- sthana	Lohita Tilkalaka Janmbhu	Sweta Charmadala Sthana	Tamra Kilasa Svitra Bhumika	Vedini (1/5) Visarpa Kushtha adhisthana	Vedini (1/5) Visarpa Kushtha adhisthana	Sthula vidradhi adhistithi
BHAVA PRAKASH	Ava-bhasini Sindhma- sthana	Lohita Tilkalaka janmbhu	Sweta Charmadala Sthana	Tamra Kilasa Svitra Bhumika	Vedini (1/5) Visarpa Kushtha adhisthana	Vedini (1/5) Visarpa Kushtha adhisthana	Sthula vidradhi adhistithi
BHELA	Udaka-dhara	Asruka- dhara	Sindhma, Kilasa sambhava adhisthana	Dadru, Kushtha Sambhava adhisthana	Alaji, Vidradhi sambhava adhisthana	Tamah- pravesh dushta sarunshika	-

Sr.No	Charaka,Bhela	Shusruta	Sharangdhara,Bhavprakash	Arundutta
1.	Udakhara	Avbhasini	Avbhasini	Bhasini
2.	Asrugdara	Lohita	Lohita	Lohita
3.	Trutiya	Sweta	Sweta	Sweta
4.	Chaturtha	Tamra	Tamra	Tamra
5.	Panchami	Vedini	Vedini	Vedini
6.	Shashthi	Rohini	Rohini	Rohini
7.	-	mamsdhara	Sthula	Sthula

From above discussion we can see that charaka suggested that skin layers are 6 and shusruta advocated that 7 layers are there in human skin. It seems that both has conflict about numbers, but acharya gangadhara clarified that third layer of charaka can be divided in two part i.e. superficial and deep layer. From this discussion we can conclude that the superficial layer and deep layer might be third (sweta) layer and fourth (tamra) layer of shusruta. Astang hrudaya advocated that skin layers are 7 but he did not mention names of layers. Astang sangrhkara followed concept of charaka i.e. according to vrudha vagbhata skin layers are 6 but he also says that some other scholars advocates about 7 layers of skin⁽⁹⁾

Colour of the skin:

Sushruta: Tejas mahabhuta with the help of rest mahabhutas gives origin to different colour to skin

which varies person to person according to prakruti⁽¹⁰⁾

Charaka: Charakacharya has mentioned prakruta varna and vikruta varna of skin also ⁽¹¹⁾ Prakruta Varna – krushna , shyama, shyamavadata, avadata. Vaikruta varna – neela, shyava, tamra, harita, shukla.

Vruddha Vagbhatta: According to vrudhdha vagbhatta, varna of shukra, matura ahara – vihara, desha, kula and teja dhatu are responsible for varna of skin.⁽¹²⁾

Varna of Shukra	Matru Ahara Vihar	Dhatu	Varna of Garbha
Shukla or Grutamandabha	Kshiradi Madhuara Ahara, Udana Vihara	Teja+Udaka+ Akasha	Gaura
Tailabha	Tiladi Vidahi Ahara	Teja+ Bhu + Vayu	Krushna
Madhvabha	Mishra Ahara	Sarvadhātu Samya	Shyama

AYURVEDA PHYSIOLOGY OF SKIN :-

(1) Twacha and Dhoshas :- Doshas like vata and pitta resides in twacha as described below⁽¹³⁾

a. Vata: Twak is indriyaadhisthana of sparsendriya i.e one of five gyanendriya is abundant with vata dosha.⁽¹⁴⁾ Acharyas described that secretions of sweat is one of the functions of vyana vata⁽¹⁵⁾ If the momentum of Vyana Vayu gets disturbed, various diseases like systemic or local diseases occurs examples are kushtha, visarpa and sarvanga gata vyadhi etc.⁽¹⁶⁾ Function of udana is imparting the aura of a person which is mainly reflects by the skin of the person. According to above quote samna vata resides in sweda vahi srotas which are directly related with twaka.

b. Pitta: According to above quote the skin is also the site of pitta dosha. Its functions are to provide Prabha and tanuta and mardavata to skin⁽¹⁷⁾ When there is increased in quantity of pitta there yellowish tinged skin occurs⁽¹⁸⁾. Skin appears dull or lustreless i.e Prabha vihin due to decrease in pitta. It clearly represents relationship between pitta and color of skin.⁽¹⁹⁾ Bhrajaka pitta is situated in Twacha. Bhrajaka means Prakashana or Deepana i.e. imparting luster to skin.⁽²⁰⁾ Acharya Mariachi, quoted that Pitta is responsible for Prakruti and Vikruti Varna which means Pitta is responsible for all type of manifestation related to color of skin.⁽²¹⁾

According to Acharya Sushruta, the part of agni i.e pitta which resides in skin is known as bhrajaka pitta and it is responsible for pachana of abhyanga, parisheka, avgaha, aalepa etc. and prakashaka of all type of chhaya (prakash means utpadak) . Here Acharya Dalhana has commented that bhrajaka pitta is situated outermost layer of skin, avabhasini.

c. Kapha : When there is decrease in kapha dosha there is dryness of skin occurs. Ropan karma is also a function of kapha dosha.⁽²²⁾ Among five subtypes of kapha dosha one variant is known as Tarpak Kapha because it's function is to provide Tarpan to both type of Indriyas.

(2) Twacha and Dhātu:

a. Rasa dhātu: According to charaka there are three rogamarga in which Twak and raktadi dhātu are bahya rogamarga. Chakrapani has explained that why Twaka is mentioned instead of rasa dhātu simply because twak is ashrya of rasa dhātu.

b. Rakta Dhātu: According to acharya sushruta Varna prasadan i.e. Imparting color to skin is function of Rakta Dhātu. When there is decrease in rakta dhātu the skin becomes dry. Kushtha, Visarpa, Kandu, Arunshi, Kotha, pidaka, Charnadala etc. are some of diseases.

c. Mamsa Dhātu: As twacha is upadhātu of mamsa, ultimately it developed from mamsa dhātu. which are basically blood born diseases but all these appear on skin.

(3) Twacha and Mala:

a. Sweda: Excreta(mala) of Meda dhātu is Sweda. The function of kleda and twak soukumaryakrut. Maintenance of kleda, twaksneha and romadharana are functions of sweda.

b. Kesh & Loma: The mala of Asthi Dhātu are Kesh and Loma, which are related with twaka.

c. Twakgata Sneha: Twakgata sneha is the mala of majja dhātu.

4) Twacha & Srotomulam :

Twacha is directly related to mamsavaha srotasa as it is the mula of this srotas but also indirectly related to swedvaha srotas because the mula of this srotas are dependent on twaka.

MODERN PHYSIOLOGY OF SKIN:

The skin is the first line of defense against the environmental agent and mirror of internal pathology.

Embryological Description :

The skin is developed from the surface ectoderm and its underlying mesenchyme (mesodermal cells).

- 1) Surface ectoderm gives rise to the Keratinizing general surface epidermis and its appendage, the pilosebaceous units, sudariferous glands and nail units at about 8 – 10 weeks of gestation.
- 2) Malacocytes, nerves and specialized sensory receptors arise from the neuro- ectoderm.
- 3) Dermis and its other elements in the skin i.e. Langerhans cells, macrophages, mass cells, fibroblasts, blood vessels, connective tissue, lymph vessels, muscles and lipocytes originate from the mesoderm.

Macroscopic Structures :

The skin is the organ of integumentary system i.e. covering system of the body. It is formed by about –8% of the total body mass. 2.2 square meter covering area. 16% of total body weight. 4.5 – 5.0 kg weight

Thickness of the skin is different according to maturation, aging and regional specialization, it may be 0.5mm on the eyelid and 4.00mm on heel. Most of the body, skin is average 1 – 2 mm thick. Skin is a fascinating organ as it forms a self-renewing and self repairing interface between the body and its environment and is a major site of intercommunication in both directions between the two. Within limit, it forms an effective barrier against microbial invasion and has properties which can protect against mechanical, chemical, cosmetic, thermal and phototoxic damage. Skin has also good friction properties assisting locomotion and manipulation by its texture. It is elastic, can be stretched and compressed within limit.

Microscopic Structure :

It is characterized by the epidermis, dermis and adnexa.

Epidermis : It is a compound tissue consisting mainly of a continuously self- replacing keratinized stratified squamous epithelium. It varies in thickness from 0.04mm on the eyelid, to 0.16mm on the palms and 0.1mm is average thickness. It takes 28 days for the keratinocytes to move from the stratum basal to stratum corneum. Epidermis contains four strata (layers): Stratum basal, Stratum spinosum, Stratum granulosum and a thin stratum corneum, but where the friction of exposure is more e.g. finger tips, palms, soles, the epidermis has a fifth layer named Stratum Lucidum in between corneum and granulosum.

1) Stratum Basal (Stratum Germinativum):

It is deepest layer of the epidermis and formed by a single row of cuboidal or columnar keratinocytes, some of which are stem cells that undergo cell division to continually produce new keratinocytes. Four types of cells are germinated through these layers which are keratinocytes, melanocytes, langerhans cells and merkel's cells.

Keratinocytes : They are principle cells of the epidermis about 90% of total cell which produce the protein keratin. It is a tough, fibrous protein and it also helps to protect the skin and save their deeper tissue from heat, microbes and chemicals. Keratinocytes are undergoing characteristic change as they progressively move upward from basal layer to cornified layer. This cell is synthesized from precursor of keratinous protein, tonofilaments which are more in number at the cells of upper side. At the mature stage of keratinocytes, in the corneum strata, nuclei and cytoplasmic organelle gradually disappear. It also produces lamellar granules, which release a waterproofing sealant.

Melanocytes : They are the dendritic cells, 8% of total epidermal cell and also synthesize and secrete melanin containing organelle called melanosomes. Their long, slender projections (Dendrites) extend in all direction between adjacent keratinocytes and transfer melanin granules to them. Melanin is a brown-black pigment which contributes to skin color and absorbs damaging ultra-violet (UV) light. The ratio of the melanocytes to keratinocytes in the basal layer is 1:4 to 1:10.

Langerhans Cells : They are originated from the mesenchymal precursors in the bone marrow and migrate to the epidermis. They constitute a small portion of the epidermal cells. Langerhans cells, play a role in induction of graft rejection, immunosurveillance and in immune reaction of the delayed hypersensitivity type especially, allergic contact dermatitis. They also produce interleukin – 1 that is required for T cell activity. They are easily damaged by UV light.

Merkel's Cells : They are originated in the ectoderm of the neural crest. They are located above the basement membrane and contain intracytoplasmic neurosecretory granules. They are supplied by myelinated nerves that lose their myelin sheaths near the epidermis and continue onward as unmyelinated axons surrounded by cytoplasm and basement membranes of schwann's cells. It is attached with tactile (merkel's) disc which is flattened process of a sensory neuron. So, merkel's cells and tactile discs are functioning in the sensation of touch. In this layer some filament like structures are formed by keratine. These filaments attached to desmosomes, which bind cells of the stratum basal to each other and to the cells, of the adjacent stratum spinosum and also attached to hemidesmosome; which bind the keratinocytes to the basement membrane between the epidermis and dermis.

2) Stratum Spinosum (Prickle cell layer)

It lies superficial to the basal layer and it consists of 5 to 12 layers of polyhedral keratinocytes connected to each other by intercellular bridges. Cells of this layer become more flattened superficially. Cells are joined tightly to other cells by desmosomes which are bundles of intermediate filaments of the cytoskeleton. These arrangement provides both strength and flexibility to the skin. For holding the cells intercellular cement is also there.

3) Stratum Granulosum :

It is 3 to 5 layers thick of flattened keratinocytes that contains darkly staining granules of a protein called keratohyalin. The lipid-rich secretion produced by the lamellar granules, works as a water repellent sealant that retards loss of body fluid and entry of foreign materials. This layer is border mark in between the deeper – metabolically active strata and the dead cells of the more superficial strata.

4) Stratum Lucidum :

It is present only in the skin of fingertips, palms and soles. It consists of 3 – 5 layers of clear, flat, dead keratinocytes that contains densely packed intermediated filaments and thickened plasma membrane.

5) Stratum Corneum :

This is the most superficial layer consisting of anucleated, flattened, cornified, 25 – 30 layers of dead keratinocytes. These cells are continuously shed and replaced by cells from the deeper strata. It serves as an effective water-repellant barrier and also protects against injury and microbes. Constant exposure of skin to friction stimulates the formation of a callus, an abnormal thickening of the epidermis.

Adnexa Of The Epidermis : It contains the eccrine glands, apocrine glands and the pilosebaceous apparatus.

Eccrine Glands : These are distributed all over the body except the vermilion borders of the lips, nailbeds, labia minora, glans penis and inner aspect of the prepuce. Their density is maximum on the palms, soles and axillae. There are two types of secretory cells named large, pale, glycogen rich cells and dark staining, smaller cells. The pale cells, initiate the sweat formation while the dark cells modify it by actively reabsorbing sodium. The major function of sweat is to dissipate heat by evaporation.

Apocrine Glands : They are located in the axillar, areolae, periumbilical, perianal, circumanal area, prepuce, scrotum, mons pubis, labia minora, external ear canal (ceruminous glands) and eyelids (moll's

glands). They are small and nonfunctional till puberty, after which they enlarge. Apocrine secretions have no function in man.

Hair Follicles : Hair follicles populate the entire skin surface with the exception of the palms, soles, dorsa of terminal phalanges of the digits, glans penis and mucocutaneous junction. It guards the scalp from injury and sun rays, decrease heat loss, protect eyes from foreign particles.

Sebaceous Glands : They are lipid producing structures that arise as outgrowth from the upper portion of hair follicles. They are distributed all over the body except palms and soles.

Nail Unit : It is comprised of the nail plate and the tissues around and underneath it. Nail plate is about 0.75mm thick, hard, convex, rectangular, translucent and situated on the dorsal aspect of the distal phalanges of every fingers and toe. It runs on the nail bed which is comprised of epithelium – a rich vascular dermis. Finger nails grows at the rate of 0.1mm daily. The growth of the toe nail is slow about 0.03mm every day. The nail unit helps in the appreciation of the fine and tactile stimulation, protect the terminal phalanges from trauma.

Dermoepidermal Junction (DEJ) : It represents a highly specialized attachment between the basal keratinocytes and papillary dermis. It helps in the attachment between the dermis to the epidermis, provides support and regulates the permeability across the epidermal – dermal interface.

On electron microscopic study it consists of following layers –

- Plasma membrane of the basal keratinocytes
- Lamina lucida – 30nm thick
- Lamina densa – 40nm thick
- Fibrous zone

The dermoepidermal junction is actively affected in various bullous dermatitis.

Dermis : The dermis rests upon the subcutaneous fat and is 15 – 40 time thicker than the epidermis. The dermis is composed mainly of non-cellular connective tissue containing collagen, elastic fibers and ground substances within which are embedded the nerves, blood vessels, lymphatics, muscles and pilosebaceous, apocrine and eccrine sweat unit. The few cells present in the dermis includes fibroblasts macrophages and some adipocytes. The dermis can be divided into –

- 1) Superficial – papillary region
- 2) Deeper – reticular region

1) **Superficial – Papillary Region :** It is about 1/5th thickness of the total dermis. It consists of

areolar connective tissue containing fine elastic fibers. Elastic fibers play a role in maintaining the elasticity of the skin. Finger prints are developed from ridge of this layer during 3rd and 4th month of foetal life.

2) Deeper – Reticular Region : It consists dense, irregular connective tissue containing bundle of collagen and some coarse elastic fibers. Both these provide strength, ability to stretch, elasticity to skin etc.

Pigmentation Of The Skin : Melanin, carotene and hemoglobin- these three pigments give skin a wide variety of color. Melanin is located mostly in the epidermis, carotene is mostly in the stratum corneum and dermis, and hemoglobin is in red blood cells within capillaries in the dermis.

Immunology Of Skin : The skin is an important immunological organ and normally contains nearly all the elements of cellular immunity with the exception of B-Cells. Much of the original research into immunology was done under the skin as a model. The immunological component of skin can be divided into.

1. Structures
2. Cells
3. Functional systems
4. Immunogenetics.

(1) Structure : The epidermal barrier is an important examples of innate immunity since most microorganisms that have contact with the skin don't penetrate it. Equally the generous blood and lymphatic supplies to the dermis are important channels through which immune cells can pass to or from their sites of action.

(2) Cells :

Langerhans Cells : The langerhans cells of the epidermis are the outermost sentinels of the cellular immune system. They are dendritic, bone - marrow derived cells characterized ultrastructurally by a unique cytoplasmic organelle known as the "Birbeck granule". Langerhans cells play an important role in antigen presentation. Dendritic cells are also seen in the dermis. These lack the birbeck granule but their other characteristic suggests that they too can present antigen.

T-Lymphocyte : T-Lymphocytes are now believed to circulate through normal skin where they are thought to mature. Different types of T-Cells are recognized. i.e.

- 1) Helper - Facilitate immune reaction
- 2) Delayed hypersensitivity - Specially sensitized.
- 3) Cytotoxic suppressor - Regulate other lymphocytes.

Surface receptors detectable by the use of monoclonal antibodies on tissue sections help to categorize the subgroups. Helper T-Cells often show the CD-4 receptors and suppressor T-Cells shows the CD-9. B-lymphocytes are not found in normal skin but are seen in some diseased conditions.

Mast Cell : These are normal residents of the dermis as are macrophages, both may be recruited to the site during inflammatory reactions.

Keratinocyte : It has recently been recognized to have an immunological function. They can produce pro-inflammatory cytokines (specially interleukin-1) and can express their surface immune reactive molecules such as MHC Class II antigens e.g. HLA – DR and Inter cellular Adhesion molecules (ICAM-I).

(3) Functional Systems :

Skin Associated Lymphoid Tissue : The skin with its attained blood supply, lymphatic drainage, regional lymph nodes, circulating lymphocytes and resident immune cells can be viewed as forming a regulatory immunological unit.

Cytokines : Cytokines are soluble molecules that mediate actions between cells. They are produced by T - lymphocytes and sometimes by other skin cells including Langerhans cells, keratinocytes, fibroblasts, endothelial cells and macrophages. Eicosanoids are nonspecific inflammatory mediators (e.g. Prostaglandins, Thromboxanes and Leukotrienes) and are produced from Arachidonic acid by mast cells, macrophages and keratinocytes.

Adhesion Molecules : The Adhesion molecules particularly ICAM- 1 are cell surface molecules found on lymphocytes and some times on endothelial cells and keratinocytes. By interacting with leukocyte functional antigens they help to bind t-cells and increase cell traffic to the area.

(4) Immunogenetics : The tissue type antigens of an individual are found in the Major Histo-compatibility Complex (MHC) located in man on the HLA gene cluster on chromosome 6. The MHC Class-II antigens of which the commonest is HLA-DR are expressed on B-lymphocytes, Langerhans cells, sometimes T-cells, Macrophages, Epithelial cells and Keratinocytes. They are vital for immunological recognition but also are involved in transplant rejection. In addition the appearance of specific HLA genes is associated with an increased likelihood of certain diseases, some of which are Autoimmune in **nature**.

Physiology Of Skin :

- Thermo Regulation
- Protection
- Cutaneous sensation
- Excretion and absorption
- Synthesis of Vitamin D
- Immunity
- Blood reservoir
- Socio-sexual communication
- Individual identification.

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