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# Anatomical review of Skin in Immune System as Primary Immune Response

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## ABSTRACT

The skin immune system comprises a complex network of cells, functioning both in immunity against invading pathogens but also tolerogenic mechanisms to ensure maintenance of immune homeostasis. The Skin is the first barrier to penetration by microbes. The skin not only defends the body by providing a nearly on penetrable barrier but also reinforces this defense with chemical weapons on the surfaces. The immune system is a wonderful collaboration between cells and proteins that work together to providing defense against infection. The skin immune system comprises a complex network of cell functioning immunity to ensure maintenance of immune system. The paper reviews the functional roles of components of immune system in the skin.

**Key words:** *Twacha, Skin, Immune System*

## INTRODUCTION

The skin is the largest Organ in the Body. Its primary function is to serve as a barrier protecting the internal organs from physical and chemical attack, invasion of pathogens and excessive water loss.<sup>[1]</sup> As the Primary immunological barrier to the external environment, the skin is rich in immune cells forming a complex network called the skin immune system comprising both innate and adaptive immune cells. Interactions between the skin micro biota and immune system play a role in determining the nature of immune responses generated in the skin. Primary immune deficiencies can affect only a single component of the immune

system or multiple cells and proteins. All components of the immune system interact with each other; it is typical to consider two broad categories of immune response the innate immune system and adaptive immune system.

## AYURVEDIC CONCEPT OF SKIN

According to Ayurveda, *Twacha* (skin) is a seat of *Sparshanendriya*. It is a *Jnyanendriya* i.e., sense organ. It is considered as a *Matrujaavayav* (organ derived from mother's genetics). The development of skin occurs in third month of intrauterine life. The formation of skin results from heat generated in the process of union of sperm (*Shukra*) and ovum (*Shonita*) and formation of other body elements (*Dhatus*) in foetal body.

The layers of skin according to Ayurveda are 1) *Avabhasini* 2) *Lohita* 3) *Shweta* 4) *Tamra* 5) *Vedini* 6) *Rohini* 7) *Mamsadhara*. According to Ayurveda, *Twacha* means skin which is related to wind element (*Vatadosha*). It does the function of sense of touch carried out through the skin by wind element (*Vatadosha*). *Bhrajaka Pitta* situated in skin gives colour to skin. Presence of sweat (*Sweda*) is essential for maintaining the health of skin.<sup>[2]</sup>

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### The skin as a barrier to infection

The Skin is the largest organ of the Vertebrate body. The skin not only defends the body by providing a nearly impenetrable barrier but also reinforces this defense with chemical weapons on the surface. In addition to defending the body against invasion by viruses and microorganisms the skin prevents excessive loss of water to the air through evaporation

### EPIDERMIS OF SKINS

**Stratum Corneum:** The outer layer called the stratum corneum, contains cells that are continuously abraded, injured and worn by friction and stress during the is many activities The body deals with the damage not by repairing the cells, but replacing them.

**Stratum Basale:** It is innermost layer of epidermis which contains some of the most actively dividing cells in the body. The cells formed in this layer migrate upward and enter a broad intermediate stratum spinosum layer. As they move upward they form the protein, keratin which makes skin tough and water resistant.

### Dermis

It provides structural support for the epidermis and matrix for many blood vessels, nerve endings, muscle, and other structures situated within skin.

**Subcutaneous layer:** The layer of subcutaneous tissue below the dermis contains primarily adipose cells. These cells act as shock absorbers and provide insulation.

### Primary immune response

#### 1. The Innate Immune System

The skin has constitutive innate immune mechanisms that help to protect against pathogens.

- The uppermost layer of the epidermis the corneal layer. It is comprised of dead keratinocytes that provide a physical barrier to skin.
- Keratinocytes produce antimicrobial peptides in response to infection.

- Beneath the corneal layer of the epidermis are the granular spinous and basal layers. These layers consist of keratinocytes expressing pattern recognition receptors (PRRs) which can detect involving microorganisms via pathogen associated molecular patterns (PAMPs) expressed on the invading microorganism cell surface. This interaction initiated early immune response in the skin.
- Dendritic cells of the epidermis known as Langerhans cells also express PRRs to initiate early immune response.
- Immune cells present in the dermis also express PRRs for Detection of invading pathogens and include DC, Macrophages, mast cells, B and T-cells, Plasma cells, Natural Killer cells (NK), Fibroblasts and invariant natural killer T-cells.

These cells are detection of invading microorganism via PRRs another important function is to maintain the balance between the host and the skin microbiome. Interaction of innate immune cells or their products influences their functions.

#### 2. Adaptive Immune System

Adaptive immune responses comprise the second category. These responses involve T-cells and B-Cells, two cell types that require "training" or education to learn not to attack our own cells. The advantages of the adaptive responses are their long-lived memory and the ability to adapt to new germs.

The most important of the immune system is to protect against infection, people with primary immunodeficiency disease.<sup>[3]</sup>

### CONCLUSION

The skin or integumentary system as a barrier against infection and injury; helps to regulate body temperature; removes waste products from the body and provides protection against UV radiation from the sun. The nature of immune responses generated in the skin depends on the types of antigen present, effects of environmental and genetic factors, and the interplay

between components of the innate and adaptive immune systems.

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