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Perspective

Developmental Immune system in Melanocytes

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DESCRIPTION

Melanocytes in the skin are melanin-producing cells that are derived from the neural crest. They migrate during fetal development and are localized in the epidermis and hair follicles, where they represent skin and hair. Melanocytes and their production Melanin pigment (a process called melanogenesis) play an important role in skin physiology. The most obvious and most studied work of melanocytes is the synthesis of melanin, which provides color to the skin and hair, and protects epidermal cells from ultraviolet radiation-induced changes in DNA structure. However, the collection of evidence shows that melanocytes are active factors in the skin immune system, involved in immune responses and have immune-modulatory properties. Histologically, melanocytes, along with keratinocytes and Langerhans cells, are strategically placed in the epidermis, forming a physical barrier that protects the skin from pathogenic and other types of lesions. The strategic positioning of melanocytes in the epidermis provides opportunities for melanocytes to respond to potentially harmful stimuli from the outside and this increases the likelihood of melanocytes responding to potential adverse environmental shocks, including ultraviolet radiation. The dendritic nature of melanocytes and their large surface area, along with their strategic location in the superficial layers of the skin, increase the likelihood that they will be immune-important cells in the immune system. Clinically, some skin-related infections are more common in people with fair skin than in those with dark skin. We hypothesized that it has an immune-modulatory effect on melanocytes and melanization skin.

Major histocompatibility complex Class II molecules are also expressed in some melanocyte cell lines. Melanocytes have also been found to express intercellular adhesion molecules such as Intercellular Adhesion Molecule 1 (ICAM-1) and CD40. ICAM-1 is the ligand for leukocyte function-associated antigen-1, which mediates antigen-specific cell contact. This introduction is required for helper T-cell function, Antigen-Presenting Cells (APCs) and interactions between lymphocytes, cell-mediated cytotoxicity, and antibody-dependent cellular cytotoxicity. CD40 antigen plays a key role in T-cell-based activation, proliferation and differentiation of B cells. Upon CD40 binding, melanocytes increase the expression of their co-stimulating and synthesizing molecules, suggesting that they may be immune.

Melanization involves the gradual oxidation of melanin production, the amino acid tyrosine and the lower aromatic compounds. Melanization plays important protective roles in many species as many toxic mediators can be produced, including semicinones, dopaquinone, indolequinones and many other reactive oxygen species. These intermediate compounds are believed to have strong antimicrobial activity and may have the ability to trap, inhibit and kill melanin, the final product of melanization, attacking bacteria and other microorganisms. Melanin may also be immune. It has been found to have immunomodulatory activity by inhibiting the production of pro-inflammatory cytokine by T lymphocytes, monocytes, fibroblasts and endothelial cells. Transfer of acidified melanin-containing organs (melanosomes) from melanocytes to neighboring keratinocytes in the outer parts of the epidermis may play a role in acidifying the statum corneum in darker pigmented skin. Acidity in the stratum corneum enhances skin barrier function and integrity/synthesis of the stratum corneum; it also has antimicrobial activity.

In response to various stimuli, melanocytes secrete a variety of immune molecules, including stimulated Nitric Oxide Synthesis (iNOS), inflammatory cytokines, and chemokin. These cytokines and chemokin derived from activated melanocytes affect keratinocytes, lymphocytes, fibroblasts, mast cells, and endothelial cells in the skin. Melanocytes can also regulate the cutaneous immune response by producing and releasing many immunomodulatory molecules, such as the Alpha-Melanocyte Stimulating Hormone (α-MSH). -MSH has a wide range of effects, including anti-inflammatory and immune-modulatory activities. Melanocytes have been shown to be capable of phagocytosis. Furthermore, melanozomas have functional and structural similarities to lysosomes and are in fact considered unique. Since phagocytosis is understood to be a prerequisite for antigen processing and presentation, phagocytosis by melanocytes suggests that melanocytes are capable of antigen presentation. Furthermore, cultured human melanocytes have

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been shown to be able to process and exhibit mycobacterial protein HSP65 and the whole-cell sonicate of Mycobacterium leprae into CD4+ T cells in an Ag-specific and MHC class II-inhibitory manner, indicating that the melanocytes can function. as nonprofessional APCs *in vivo*.

Macrophages are vital cellular components of the innate immune system. After tissue injury or infection, macrophages exhibit inflammatory phenotype and secrete pro-inflammatory mediators such as tumor necrosis factor, NO and interleukin-1, which are involved in the activation of various antimicrobial mechanisms. Melanocytes are located in the epidermis or in the hair follicle pigmentary unit, where melanocytes and their products can interact with other cells. This is in line with our observation that specific soluble factors secreted by murine melanocytes may have an immunological effect on macrophage-mediated anti-infection immunity by cross-linking with macrophages.

CONCLUSION

The concept that melanocytes are not only professional melanin-producing cells but also active factors in the dermatological immune system. However, the immunity of melanocytes has not been fully explored. Additional work is needed to develop a comprehensive understanding of the immunological role played by melanocytes.